ELECTRICAL REVIEW

FRIDAY
3 OCTOBER 1958

WEEKLY
PRICE 1s 6d

NO INTERRUPTION TO NORMAL SERVICE

Not until the last train has gone through can work commence on cable laying from the track, for the Southern Region's Kent Coast Electrification Scheme. Henley's £1 million contract involves supplying, jointing and supervising the installation of 90 route miles of 33 kV 3-core oil-filled cable and pilot/supervisory cable. Most of the work must be done by night: a job calling for highly specialised experience, and a contribution which Henley's are proud to make towards the modernisation of British Railways.

LET

HENLEY

CABLES CARRY THE CURRENT

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.
51-53 HATTON GDN., LONDON, E.C.1

MEM

CELEBRATE THEIR 50TH ANNIVERSARY

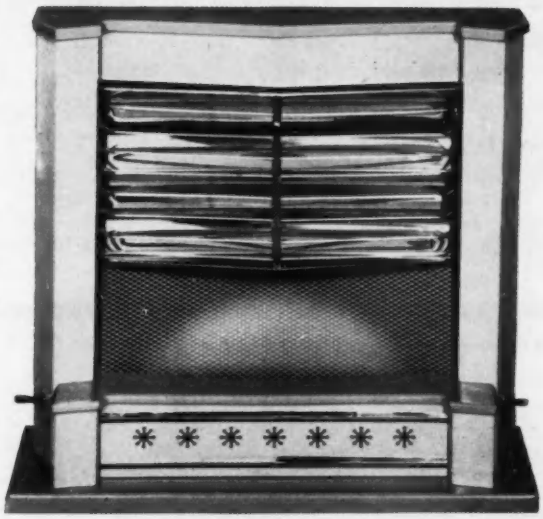
Even one of the most forward-looking organisations in a forward-looking industry can look back for once when it reaches its 50th anniversary. Over the past half century two big developments have made challenges to MEM – the almost universal electrification of Britain's homes and factories, and the individual motorisation of industrial machinery. Whatever the next 50 years may offer MEM is already preparing to meet these new challenges.

1908 - 1958

MIDLAND ELECTRIC MANUFACTURING CO. LTD · TYSELEY · BIRMINGHAM 11

Heatrae

of Norwich



THE HEATRAE MAJESTIC

A most attractive electric fire for home or office, featuring Extra Length bars which give comfortable warmth for the largest rooms yet can be controlled to suit small rooms. Two colour schemes are available — Cameo Fawn and Pebble Grey or Warm Stone and Coral — and the price is attractive too. Write for details.

Manufacturers of Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towel Rails, Airing Cupboard Heaters, Electric Fires, Flameproof Heating Apparatus, Food Trolleys, Warming Plates, Air Heaters. Specialists in Steam Heated Oil Heaters and Calorifizers for Shipboard.

HEATRAE LIMITED

Pioneers since 1920 in all-electric water heaters

NORWICH — ENGLAND

Telegrams: HEATRAE · NORWICH Telephone: NORWICH 25131 (Private Exchange)

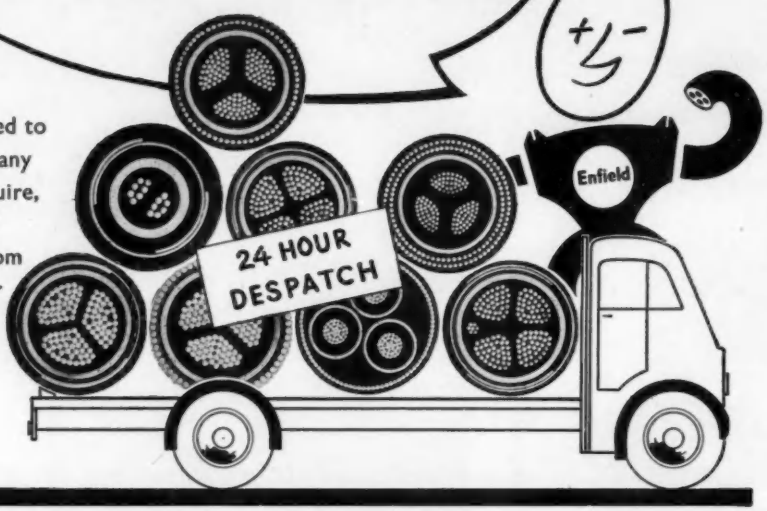
Remember

Poppy Day

A

LOW TENSION PAPER CABLES

from stock



We are prepared to cut and supply any length you require, no matter how small, either from our standard or sundry stock.

If you require *immediate* service, please telephone your nearest Enfield Branch.

ENFIELD SERVICE IS AVAILABLE AT:—

BRANCHES

BELFAST
Telephone: Belfast 21424/5
Branch Manager: W. S. Mercer.

BIRMINGHAM
Telephone: Calthorpe 3941/2/3
Branch Manager: J. J. Timmins.

BRIGHTON
Telephone: Brighton 25828/9
Branch Manager: B. Smith.

BRISTOL
Telephone: Bristol 24271/2
Branch Manager: G. N. Charters.

CARDIFF
Telephone: Cardiff 21266
Branch Manager: E. Evans.

GLASGOW
Telephone: South 3581/2
Branch Manager: A. B. MacLean.

HULL
Telephone: Hull 35018
Branch Manager: C. Wood.

IPSWICH
Telephone: Ipswich 51314
Branch Manager: C. O. Tompkins.

LEEDS
Telephone: Leeds 32661
Branch Manager: W. F. Tighe.

LONDON
Telephone: Museum 2588
Branch Manager: E. Hupfield.

LUTON
Telephone: Luton 4234
Branch Manager: A. B. Chaplin.

MANCHESTER
Telephone: Central 5074
Acting Branch Manager: J. A. Walker.

NEWCASTLE
Telephone: Newcastle 27208
Branch Manager: F. R. Mackenzie.

NOTTINGHAM
Telephone: Nottingham 45013/4
Branch Manager: R. P. Swinbank, A.I.E.E.

SOUTHAMPTON
Telephone: Southampton 69410
Branch Manager: W. F. Lawrence.

DEPOTS

CANTERBURY
Telephone: Canterbury 3881
Representative: L. F. Stotesbury.

EDINBURGH
Telephone: Caledonian 1597
Representative: J. McDonald.

SHEFFIELD
Telephone: Sheffield 20555
Representative: P. Collins.

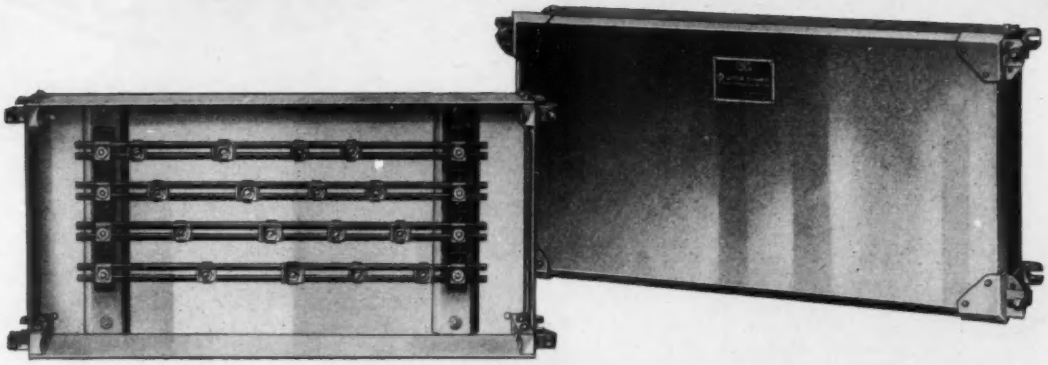
STOKE
Telephone: Stoke-on-Trent 21310

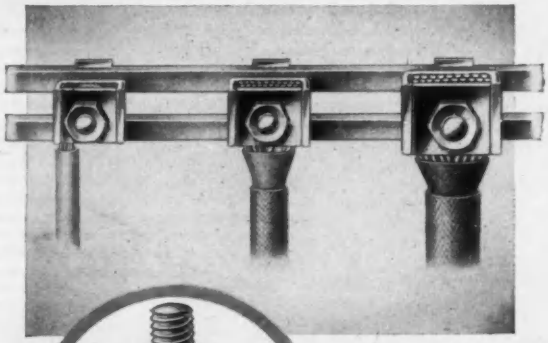
ENFIELD CABLES LIMITED

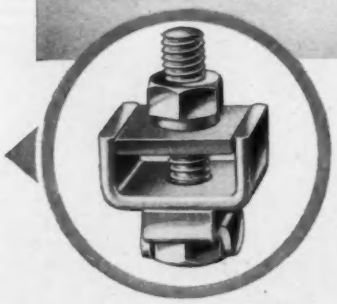
Sales Headquarters: Victoria House, Southampton Row, W.C.1. Telephone: HOLborn 9292 (10 lines)
Telex No: 23813. Answer Back: ENFIELD LONDON.
Telegrams: Enfelcama London Telex. Cables: Enfelcama London.

Make sure you receive regular monthly details of our stocks by adding your name and the letters P.C.S.L. to your letter heading and mailing it to our Sales Headquarters. You will then receive a copy of the "Enfield Paper Cables Stock List" each month.

MINIBAR BUSBAR CHAMBERS







- THE EASY AND EFFICIENT BILL SYSTEM FOR LINKING UP FEEDERS ON SMALL DISTRIBUTION SYSTEMS.
- 100 AMPERE BUSBARS IN FIVE STANDARD LENGTHS. 12 ins. TO 36 ins. IN TWO, THREE, OR FOUR BAR SIZES.
- BILL SLIDING CABLE CLAMPS QUICKLY FITTED WITHOUT DRILLING.
- BILL QUICK WIRING CLAMPS CAN BE INSTANTLY MOVED TO ANY POSITION ALONG THE BUSBARS.
- ALL STANDARD SIZES AVAILABLE EX STOCK.

- SEND NOW FOR PRICE LEAFLET — MB 657.

You cannot buy better gear

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
BIRMINGHAM·20

LONDON, S.W.1 A. W. ZELLEY, N. PAYNE, GILLINGHAM ST.
MIDLANDS G. H. GARBETT, H. WILLIAMS HEAD OFFICE
NORTH MIDLANDS C. G. BACHELOR HEAD OFFICE
EAST MIDLANDS J. A. PEARCE, HEAD OFFICE
CHELTENHAM C. GEARING, HIGH ST.
MANCHESTER 3 H. H. POLLARD, J. H. RAMSAY, F. A. MAYOR, WOOD STREET
BRISTOL, 3 W. L. WHITE, CHURCH LANE
LEEDS, 7 N. SHARPLES, G. SUTTON, LOVELL RD.
GLASGOW J. D. HARRIS, I. J. HARRIS, SANDYFORD PLACE
BELFAST J. BALLENTINE DONEGALL ST.

WATCH YOUR POWER COSTS WITH THE

BRYCE

POWER FACTOR TESTER

Your clip-on ammeter can now be used for the measurement of Power Factor.
The ammeter is used in the normal way, with the coil of the Bryce Tester over the jaws of the ammeter and with potential leads connected across phase and neutral.

Accurate reading can be obtained WITHOUT BREAKING INTO THE CIRCUIT

Write for descriptive leaflet 38*B*1958.

BRYCE manufacture Power Factor Correction Capacitors in all sizes up to the largest produced in this country.

BRYCE ELECTRIC CONSTRUCTION COMPANY LTD.

Kelvin Works, Hackbridge, Surrey. Telephone: Wallington 2601

In Association with HACKBRIDGE CABLE CO. LTD.

Broadway/bec/5

'phone your nearest stockist of BTH ELECTRIC MOTORS for delivery today

BEXHILL 4010	Ford Wholesale Electric Ltd
BIRMINGHAM Central 5044	Buck & Hickman Ltd
BRISTOL 20011	Gardiner Sons & Co Ltd
CAMBRIDGE 56881	Wright (Cambridge) Ltd
CANTERBURY 4821	Meers (Engineering) Ltd
COVENTRY 60247	Lee Beesley & Co Ltd
DARLINGTON 2387	Cox-Walkers Ltd
DERBY 49192	Z Electric Lamp & Supplies Co Ltd
EASTBOURNE 5628	Ford Wholesale Electric Ltd
EAST GRINSTEAD 716	Ford Wholesale Electric Ltd
EXETER 75201	W. J. Mathews (Exeter) Ltd
GLASGOW Central 7174	Buck & Hickman Ltd
HORSHAM 2213	Ford Wholesale Electric Ltd
HOVE 71268	Ford Wholesale Electric Ltd
LEICESTER 23457	Perkins & Spencer Ltd
LEEDS 25494	Buck & Hickman Ltd
LEEDS 20834	Green & Smith Ltd
LINCOLN 11337	Penney & Porter Ltd
LONDON Bishopsgate 7676	Buck & Hickman Ltd, E1
LONDON East 2428	J. G. Sneath Ltd, E14
LONDON East 3259	J. G. Sneath Ltd, E14
LONDON Monarch 5474	C. J. Ferguson & Sons Ltd, EC1
LONDON Terminus 3666	British Central Electrical Co Ltd, EC1
LONDON Thornton Heath 2231	Buxton & Longley Ltd
LONDON Tottenham 2441	A. F. Phillipson & Co Ltd, N17
LUTON 2930	Shoolbred Rewinds Ltd
MAIDENHEAD 3545	Lewis Electric Motors (Maidenhead) Ltd
MANCHESTER Ardwick 4351	Buck & Hickman Ltd
MIDDLESBROUGH 2267	C. Horne & Co Ltd
NEWCASTLE-UPON-TYNE 22141	Watson-Norie Ltd
NORTHAMPTON 31401	E.M.F. (Electrical) Ltd
NOTTINGHAM 52838	Z Electric Lamp & Supplies Co Ltd
PRESTON 56208	J. Walton (Electrical) Ltd
SWANSEA 53917	Newey & Eyre Electrical Co Ltd
TUNBRIDGE WELLS 3003	Ford Wholesale Electric Ltd
WALLSEND-UPON-TYNE 63353	Watson-Norie Ltd
WOLVERHAMPTON 26354	The Midland Electric Installation Co Ltd

B T-H

For technical advisory service on electric drives consult your nearest BTH District Office :— Belfast, Birmingham, Bristol, Cambridge, Cardiff, Dublin, Glasgow, Leeds, Liverpool, London, Manchester, Middlesbrough, Newcastle-upon-Tyne, Nottingham, Sheffield, Swansea.

BRITISH THOMSON-HOUSTON

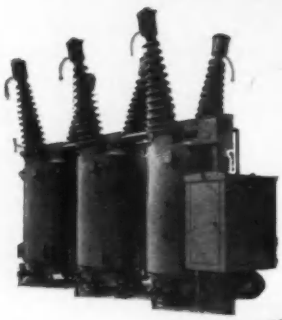
THE BRITISH THOMSON-HOUSTON COMPANY LIMITED · RUGBY · ENGLAND

an A.E.I. Company

A5305

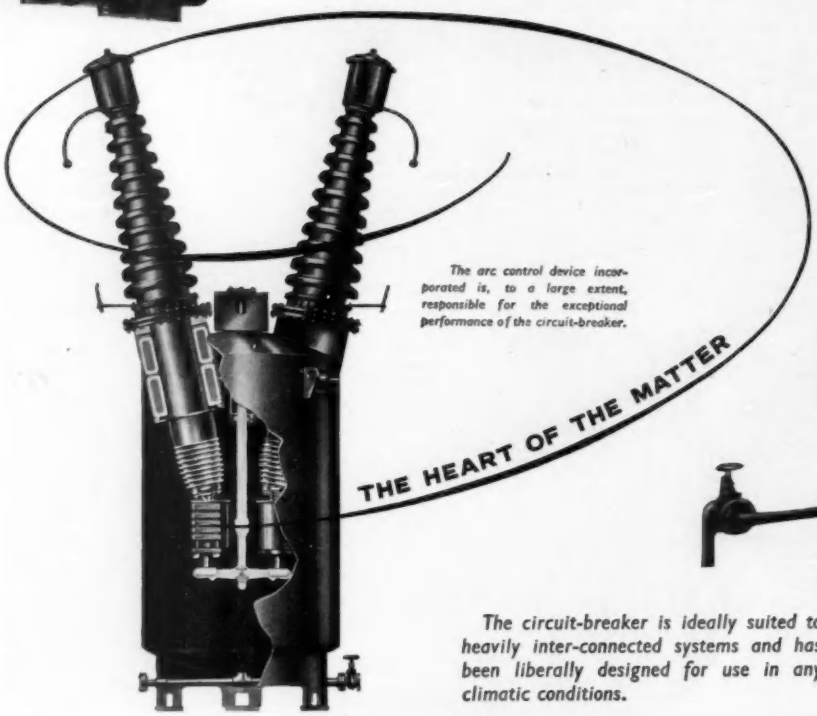
5000 MVA Performance

at 132 kV, 3-phase, 50 cycles



The "FERGUSON PAILIN" Type XOPR60 oil circuit-breaker is outstanding in the field of bulk-oil circuit-breaker design, inasmuch as its principle feature is a *proved* ability to interrupt and "make" fault currents equivalent to 5,000-MVA at 132kV.

In line with "FP" activities in switchgear development generally, this represents a high level of achievement.



The arc control device incorporated is, to a large extent, responsible for the exceptional performance of the circuit-breaker.

THE HEART OF THE MATTER

The circuit-breaker is ideally suited to heavily inter-connected systems and has been liberally designed for use in any climatic conditions.

Ferguson Pailin LIMITED *for Switchgear*

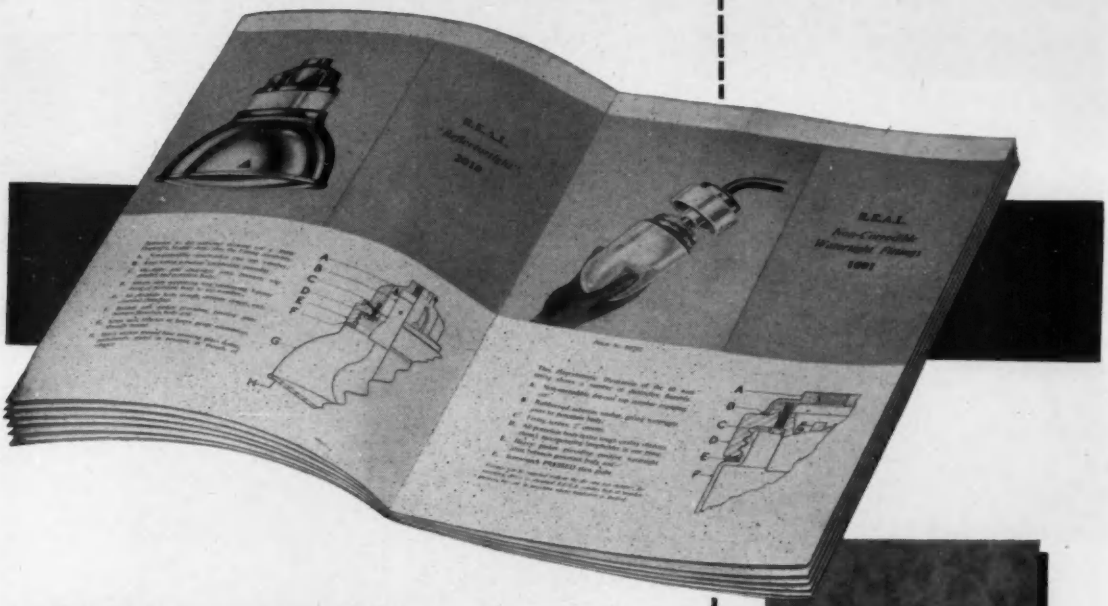
An A.E.I. Company

Head Office & Works: **HR. OPENSHAW MANCHESTER 11,** *Telephone* : DROylsden 1301 (Pte.Branch Ex)

LONDON OFFICE : Bush House, Aldwych, W.C.2 BIRMINGHAM OFFICE : Windsor House, 656 Chester Road, Erdington, 23 GLASGOW OFFICE : Central Chambers, 109 Hope Street, C.2.

REPRESENTED IN PRINCIPAL OVERSEAS TERRITORIES

Watertight Evidence...



A NEW catalogue, illustrating non-corrodible lighting fittings. Of great value to consultants and illuminating engineers.

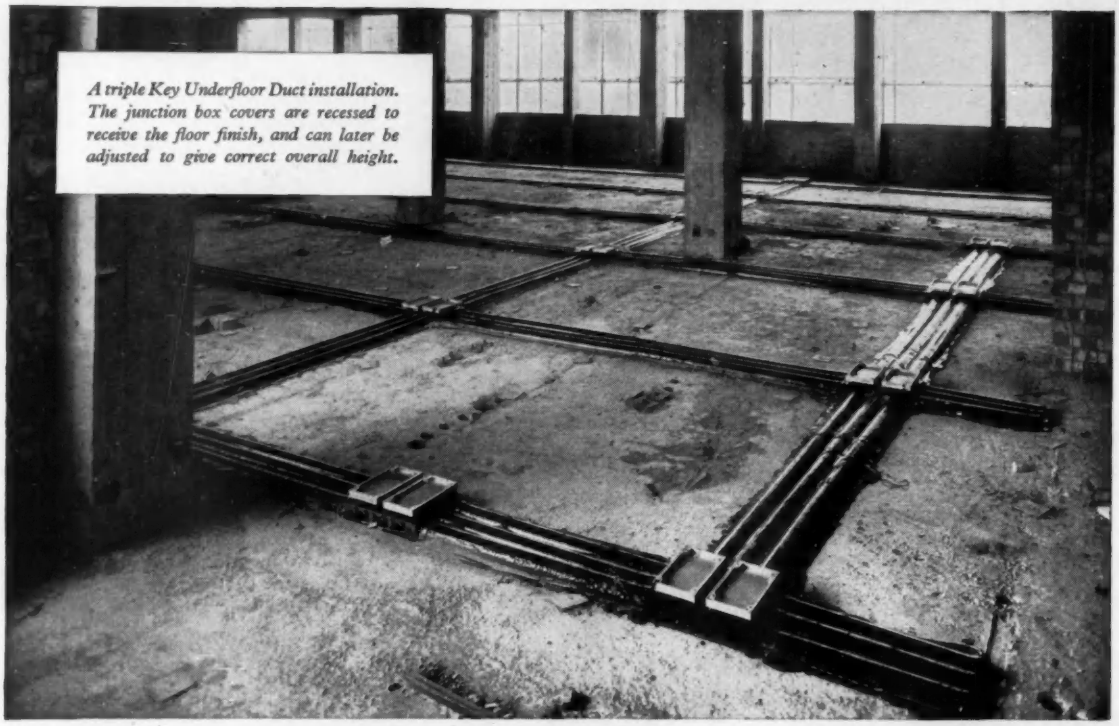
This unique publication details "Reflectortight", Porcelain Watertight, and other lighting fittings capable of withstanding the most severe working conditions. R.E.A.L. have the answer for the 'impossible' situation.

This list is priceless!
If you have not yet received your copy, please write, asking for Catalogue No. P 5806.

REAL

R.E.A.L. *is the registered trade mark of*
ROWLANDS ELECTRICAL ACCESSORIES LTD., R.E.A.L. WORKS, BIRMINGHAM 18

Now and for the future—
Key Underfloor Duct
solves wiring problems economically



A triple Key Underfloor Duct installation. The junction box covers are recessed to receive the floor finish, and can later be adjusted to give correct overall height.

Electric power and telephone outlets can be installed and added as necessary when Key Fibre Underfloor Duct is used. On a materials plus labour basis the cost of installations is lower than any metal system. Because of their light weight and ease of cutting and fitting, Key ducts can be quickly laid. Since there is no necessity to pre-position outlets, the architect can install an underfloor duct scheme, and later fit outlets to suit the occupant's requirements. The fitting of these outlets is a quick and simple matter and the most complete range of fittings is available for lighting and telephone systems.

easy to lay—low cost
completely adaptable

KEY UNDERFLOOR DUCT conforms with B.S. 815 and is the original Underfloor Duct System. Key have the widest experience of Underfloor Duct Systems in the U.K.

Speed the job—cut the cost with the

KEY UNDERFLOOR DUCT SYSTEM

ALSO KEY FIBRE CONDUIT FOR HEAVY DUTY CABLES

A PRODUCT OF **KEY ENGINEERING COMPANY LIMITED**
Elevator Road, Trafford Park, Manchester, 17. Telephone: Trafford Park 2056/7

Reed

TGA UDI

'Erskine Heap' installation at

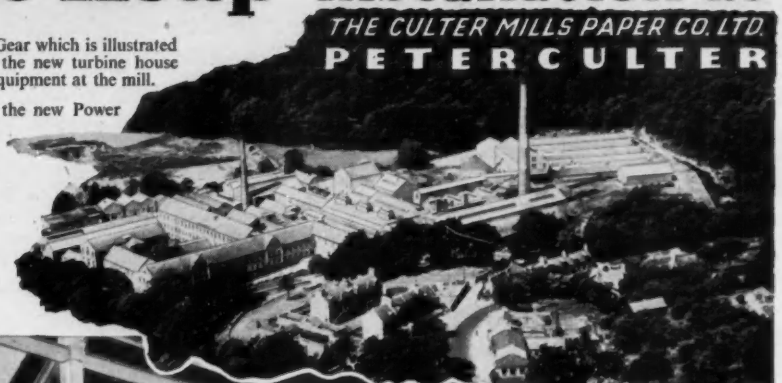
THE CULTER MILLS PAPER CO. LTD. PETERCULTER

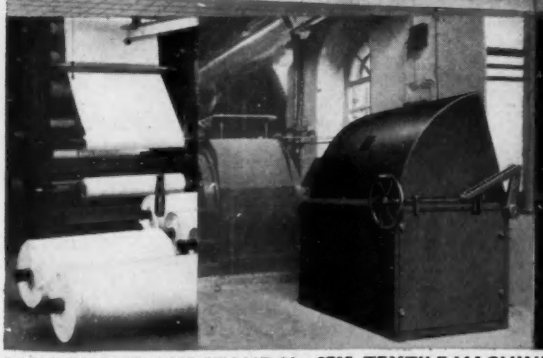
The Switchgear and Motor Control Gear which is illustrated below is part of the installation of the new turbine house and modernisation of the electrical equipment at the mill.

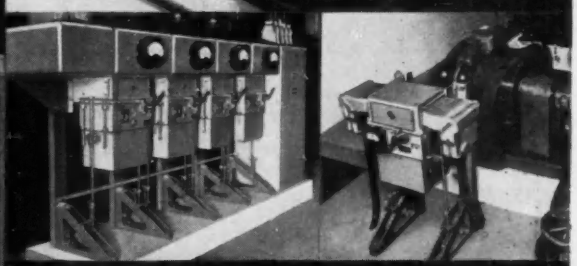
The large centre illustration shows the new Power House with the A.C. and D.C. Switchgear for controlling the 2400 KW Alternator and the 850 KW D.C. generator of the new turbine set.

In the lower illustrations are other switchboards and motor control gear typical of those throughout the mill.

Consulting Engineer, A. B. Mallinson, M.I.Mech.E., M.I.E.E.







ERSKINE, HEAP & Co LTD

SWITCHGEAR SPECIALISTS

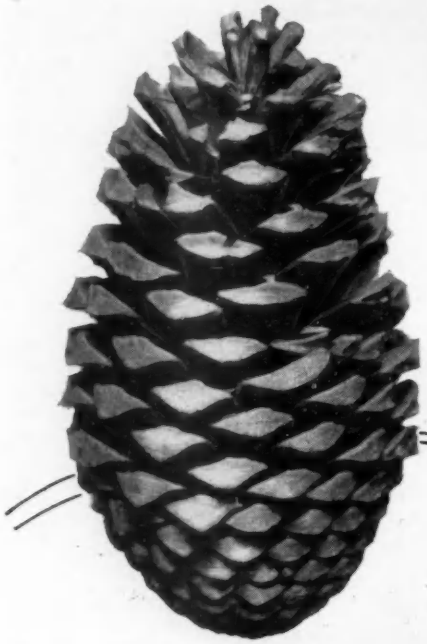
Head Office & Works BROUGHTON, MANCHESTER (7)

London Office GRAND BUILDINGS, TRAFALGAR SQ., W.C.2

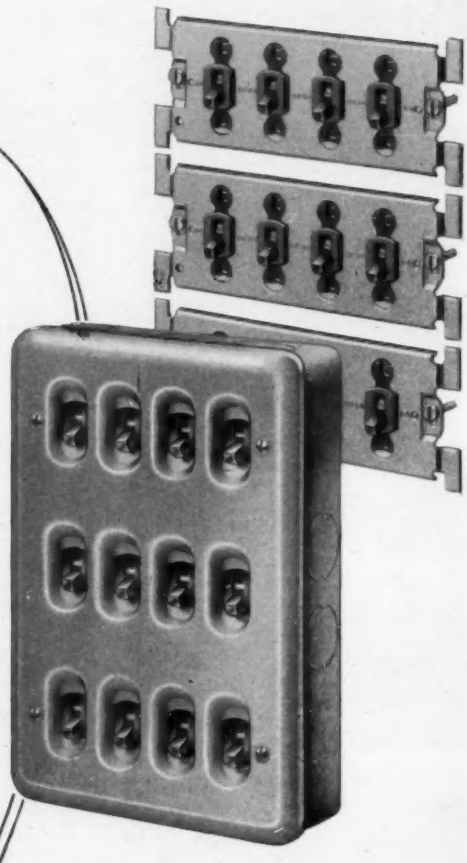
BRANCH OFFICES AND AGENCIES IN ALL PARTS OF THE WORLD

WELCOME TO OUR STAND No. 2705, TEXTILE MACHINERY EXHIBITION, BELLE VUE, MANCHESTER, OCT. 15-25th

719



"Closegang" construction



A NATURAL SYMMETRY of design with compactness, adaptability and ease of installation are among the features of the new Crabtree "Closegang" range of 1 to 12 gang assemblies for flush and surface mounting.

These handsome units are available for the interchangeable assembly on B.S. 1299 fixing centres of 5 and 15 amp. one and two way switches and intermediate switches, bell pushes and neon indicator lights. Their many advantages will appeal to both installation engineer and architect.

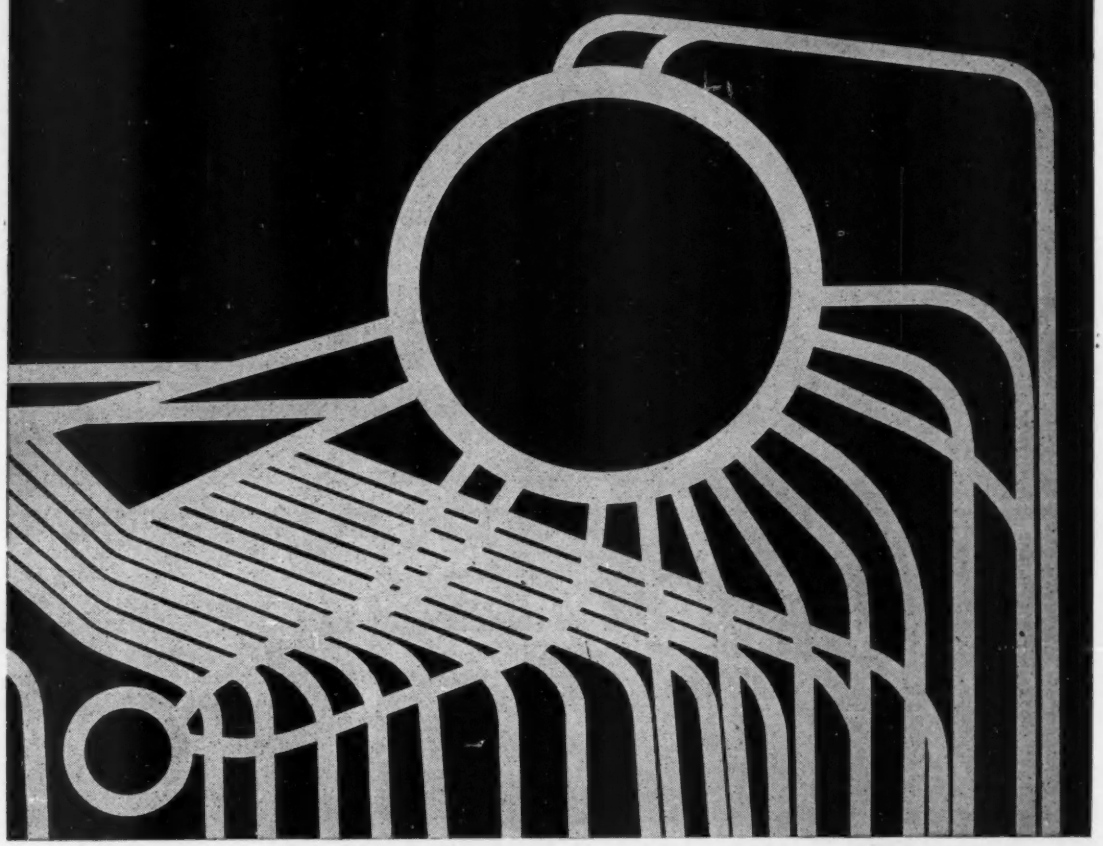
Full details are given in Crabtree Publication No. 1197, copies of which are available on request.

"Closegang" and other Crabtree products will be on display at the Manchester Building Trades Exhibition (Stand No. 87) from 14th—25th October

CRABTREE CLOSEGANG ASSEMBLIES

J. A. CRABTREE & CO. LTD., LINCOLN WORKS, WALSALL, STAFFS. C.777

water-tube boilers



We build water-tube boilers of Foster Wheeler designs for outputs between 20,000 and 1,000,000 lb. per hour at steam conditions up to 2,350 p.s.i.g., 1,050°F, with or without re-heat, fired by liquid, solid or gaseous fuel. They are generously designed to maintain high efficiency over prolonged steaming periods.

Richardsons Westgarth (Hartlepool) Ltd

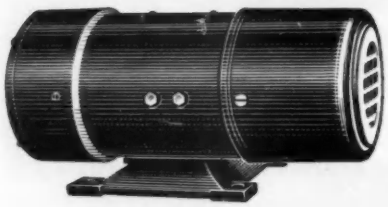
A member of the RICHARDSONS WESTGARTH GROUP which co-ordinates the land and marine activities of:

THE NORTH EASTERN MARINE ENGINEERING CO. LTD.
PARSONS MARINE TURBINE CO. LTD.
GEORGE CLARK & NORTH EASTERN MARINE (SUNDERLAND) LTD.
RICHARDSONS WESTGARTH (HARTLEPOOL) LTD.
THE HUMBER GRAVING DOCK & ENGINEERING CO. LTD.
RICHARDSONS WESTGARTH ATOMIC LTD.

ASSOCIATED COMPANY: ATOMIC POWER CONSTRUCTIONS LTD.

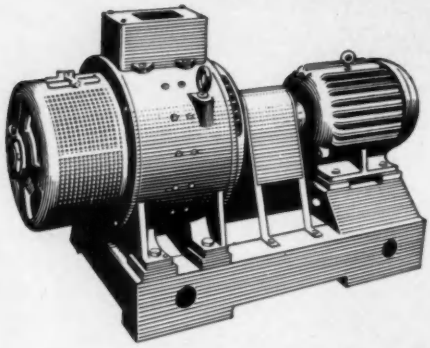
RICHARDSONS WESTGARTH (HARTLEPOOL) LTD., HARTLEPOOL, CO. DURHAM AND AT 58 VICTORIA ST., LONDON, S.W.1

ELECTRICAL EQUIPMENT



High Frequency Motor Alternator 40 VA 600 c.p.s. single phase

High Frequency Motor Alternator Set 5 kVA, 208 volts, 3 phase, 400 c.p.s. 3000 r.p.m.



For further details write to the manufacturers.

NEWTON DERBY

NEWTON BROTHERS (DERBY) LIMITED

ALFRETON ROAD · DERBY

PHONE: DERBY 47676 (4 LINES) GRAMS: DYNAMO, DERBY

London Office: IMPERIAL BUILDINGS, 56 KINGSWAY W.C 2

"PICATHENE"

STANDARD TYPES

TO B. S. I. SPECIFICATIONS 1557 AND 2004

Highest Quality Plastic Insulated Cables

AT ECONOMIC PRICES

COPPER OR ALUMINIUM OVERHEAD LINES

PLASTIC INSULATED CABLES FOR ALL INDUSTRIES

PLASTIC INSULATED CABLES LIMITED

BUCKINGHAM AVENUE • SLOUGH • BUCKS

TELEPHONE: SLOUGH 22084 • TELEGRAMS: "PICABLE" SLOUGH

NORMAN F. BADLEY MANAGING DIRECTOR

Cooker Control with a Pedigree

Housewives are becoming more and more design conscious. They want every detail of the kitchen to look "contemporary". They reject non-functional designs. They reject fitments that harbour dirt. They want new and shining kitchens, that will stay new and shining with the minimum of labour.

Have a look at the photograph below. Note the simple, graceful modern design. Not a single unnecessary ridge or line. Nothing to harbour dirt or grease. *The cover is rounded—a wipe-over keeps it sparkling clean.*

"Sonex" 780

The Contractor's Viewpoint

As a contractor, your customers' demands are paramount. "Sonex" Units attend to that perfectly.

But you have to have an eye to *ECONOMY*. Especially, savings of your electricians' time in fixing can make all the difference to your profit margins.

"Sonex" Units provide you with that vital saving. They are designed for quick and foolproof fixing. The knock-outs are real time-savers. No need to "bash" them—they tap out readily, giving a clean conduit connection.

Easy Knock-outs

In the *Flush* pattern, there's a special saving. The mounting brackets are so arranged that you get positive flush fitting straight away. No "fiddling" to get alignment—the Unit almost puts itself in position.

Equally good Technically

"Sonex" Units are made by "Wylex". This means high quality.

SONEX

Metalclad Cooker Units

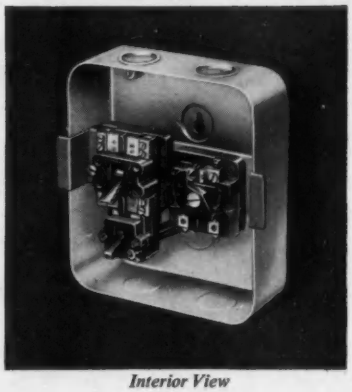
Made by Wylex

SEE THEM AT YOUR WHOLESALER

The Cooker Switch is Wylex 30 amp. DP/AC. B.S.1363 Socket outlet is

Positive Flush Fixing

controlled by 15 amp. DP/AC Switch. The Unit is complete in metal box, Bonderized and stove-enamelled cream. The cover is a Wylex moulding.



Interior View

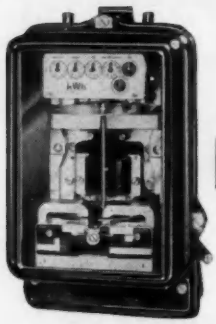
Two patterns available, both at List Price 28/8 (excluding Plug):—

SURFACE Pattern. Cat. No. **770**

FLUSH Pattern. Cat. No. **780**

GEORGE H. SCHOLES & CO. LTD., WYLEX WORKS, WYTHENSHAWE, MANCHESTER 22

TYPE K
SINGLE PHASE



TYPE KT
3 PHASE
3 WIRE

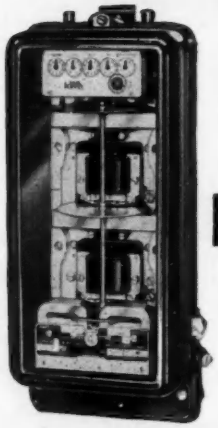
C & H

"K" Series of Meters

TYPE KTAC
3 PHASE
3 WIRE,
PRECISION
PATTERN
WITH
"FLICK"
CONTACTOR

Please apply to us for appropriate Catalogue Sections covering this "K" series of meters

TYPE KP
SINGLE PHASE—
PREPAYMENT PATTERN

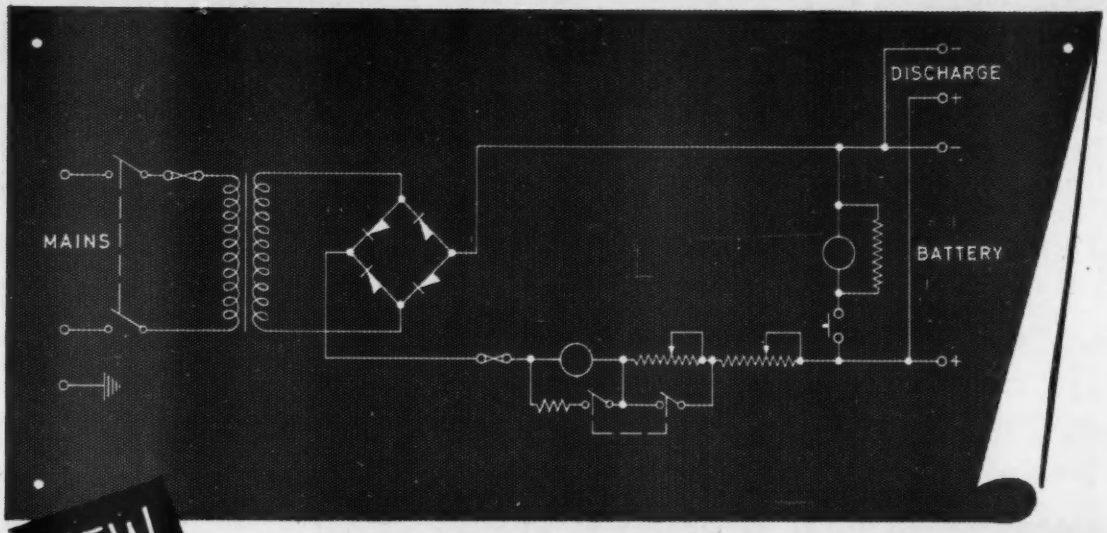


TYPE KT4
3 PHASE
4 WIRE

Chamberlain & Hookham Ltd.

SOLAR WORKS, BIRMINGHAM 5. TELEPHONE: MIDLAND 0661 & 0662

London Office: MAGNET HOUSE, KINGSWAY, W.C.2. TELEPHONE: TEMPLE BAR 8000



NEW

HIGHER CAPACITY · LOWER INITIAL COST!

POWER PACK

Many worthwhile improvements distinguish this new equipment, now available for immediate delivery. Current for tripping is higher. Tiered cell layout reduces cabinet dimensions—saves floor space. Two-rate charger replaces single-rate. Modern styling makes exterior cleaning easier and quicker. Here is equipment long known and trusted for its utter reliability, now developed to even higher efficiency—*at lower initial cost.*

For switch tripping, burglar alarms, fire alarms, bell systems, electric impulse clocks, or any application where an intermittent or continuous slow discharge is required.

S89

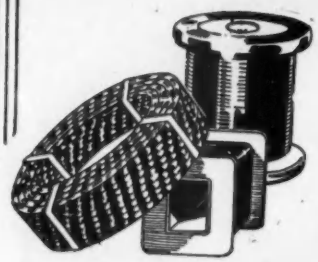
A PRODUCT OF CHLORIDE BATTERIES LTD

Makers of Exide Batteries

Exide Works · Clifton Junction · Swinton · Manchester · Telephone Swinton 2011

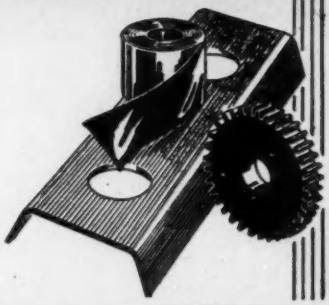
AND AT LONDON ELGAR 7991 · BRISTOL 64086 · MANCHESTER BLACKFRIARS 1158 · WEST BROMWICH 2361 · LEEDS 20248 · GLASGOW BRIDGETON 3734 · BELFAST 27953

INSTRUMENT WIRES | INSULATING MATERIALS



ENAMELLED, SILK and COTTON covered Copper Wires, Single or Stranded, also Tinned, Paper, Asbestos and Plastic Westoflex covered. RESISTANCE WIRES. LITZ WIRES.

MICA, MICANITE and BAKELITE in all forms. Heat Resisting Boards. Canvasite for Silent Gears. Oil Cloth, Silk and Paper Slot Insulations. Insulating Varnishes. Varnished Fabric and Plastic Sleeving. Moulded and Machined Pieces, etc.



WEST INSULATING COMPANY LTD.

2 Abbey Orchard Street, Westminster, S.W.1
Telephone: Abbey 2814 & 7352

WILLIAM ESTD. GEIPEL 1871 LIMITED

CONTROL GEAR
A.C. and D.C.
for all Industrial purposes

STARTERS
DIRECT ON LINE
PUSH BUTTON
REVERSING
STAR DELTA

REGULATORS
RESISTANCES
RELAYS
CONTACTORS
SWITCHES
ETC.

A full range of Standard Equipment. Special Equipment designed and made to Customers' requirements.

VULCAN WORKS · 156-170 BERMONDSEY ST · LONDON · S.E.1

MEASURING INSTRUMENTS
IMMEDIATE DELIVERY

Most Basic Ranges available **ex-stock** for immediate despatch
Special ranges—delivery 7/14 days

Round, Square or Rectangular patterns available, also full range of Industrial Switchboard Instruments. Portable and Laboratory Instruments, Moving Coil, Moving Iron, Thermo Couple, Electrostatic.
We can supply Meters with Non-Standard Ranges in Current, Volts or Ohms. To B.S. 89. Industrial or Precision Grade accuracy.

We are the largest stockists of Electrical Measuring Instruments in the Country.

Weston Model S157
Rectangular Flush 5" x 4" approx.

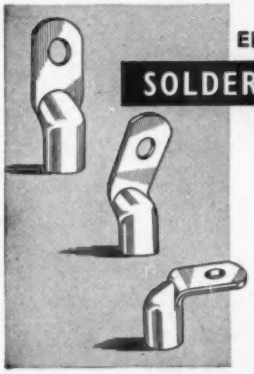
Stockists of Meters by
Weston, Turner, Baldwin, E.A.C., Weir and other leading manufacturers

Clients are invited to inspect the display of instruments at our New Offices and Showrooms

ELECTRONIC EQUIPMENT AND TEST APPARATUS MANUFACTURED TO CUSTOMERS' DESIGN OR SPECIFICATION

May we quote for your requirements?

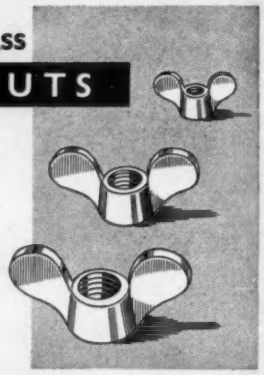
ANDERS ELECTRONICS LTD.
103 HAMPSTEAD ROAD, LONDON, N.W.1
Telephone: EUSton 1639
Contractors to G.P.O. and other Government Departments



ELECTRIC CABLE SOLDERING SOCKETS

A.G.S.

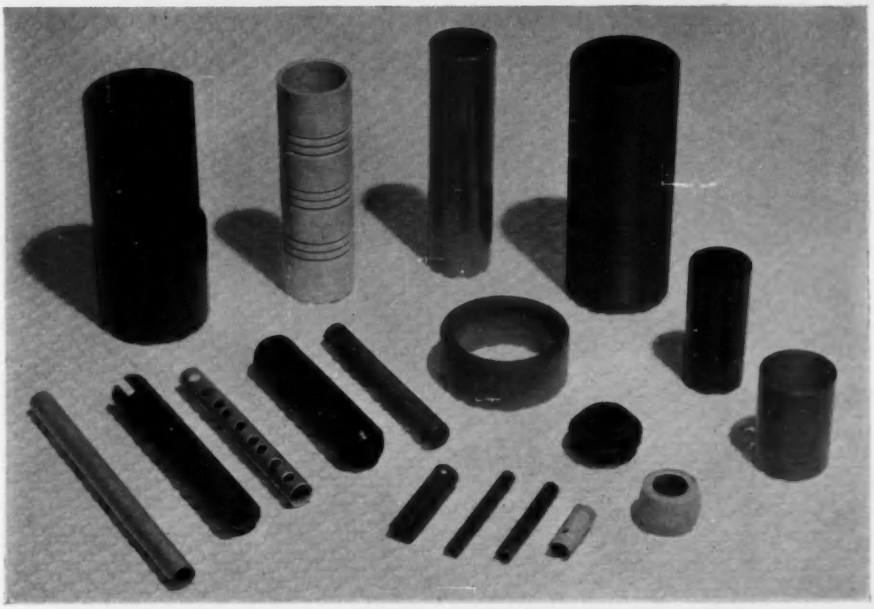
STAMPED BRASS WING NUTS



Available in many sizes and manufactured to exacting specifications, our components are used in many of Britain's finest products. Write for Illustrated Leaflets AGS 1 and AGS 2.

A. G. SUTHERLAND LTD.
WARWICK ROAD, BIRMINGHAM 11. Tel.: VICtoria 2184-5
Also at London

LANTEX LAMINATED TUBES



For the Electrical Industry there is a range of qualities to meet all specifications and tubes can be supplied in either standard lengths, or cut and fabricated in accordance with drawings.

Special grades are available with controlled mechanical properties for applications in a wide variety of other fields.

Please write for copies of newly published technical data sheets for all grades.

LANGLEY LONDON LIMITED

KELVIN WAY, CRAWLEY, SUSSEX

Telephone : CRAWLEY 25955 (5 lines)

The Conquest of Friction

Instrument making flourished in the 18th century as scientific experiment became fashionable, and practical use was now made of several of the anti-friction devices first proposed by Leonardo da Vinci two centuries before. Henry Sully's chronometer (put forward in the competition for the prizes offered in 1714 by the Board of Longitude) employed such bearings, and Attwood in his 'machine' for demonstrating and measuring the acceleration due to gravity also successfully borrowed one of da Vinci's devices.

Today, whenever there is need for accurate and highly sensitive measuring equipment involving the use of mechanical action, there you will find SKF, for the designers of the 20th century turn automatically to SKF knowing that for high-quality precision ball and roller bearings, SKF are unsurpassed.

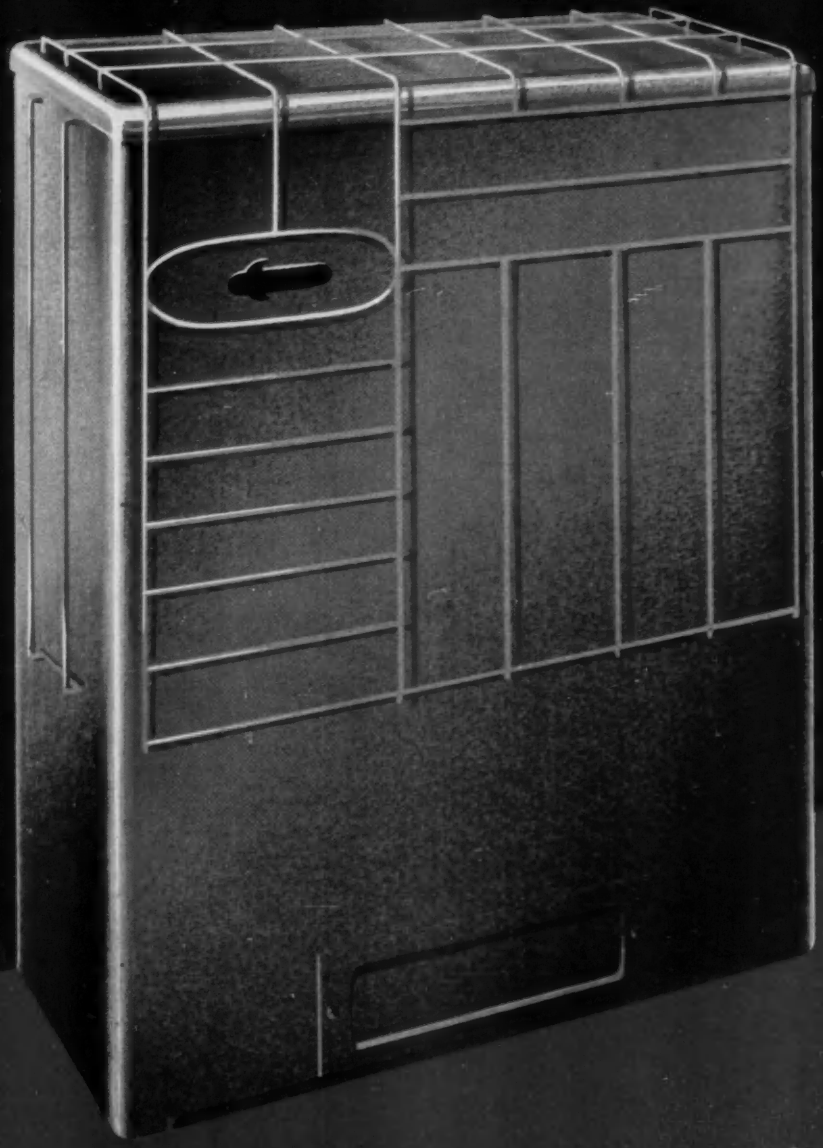
THE SKEFKO BALL BEARING COMPANY LIMITED · LUTON · BEDS

G152

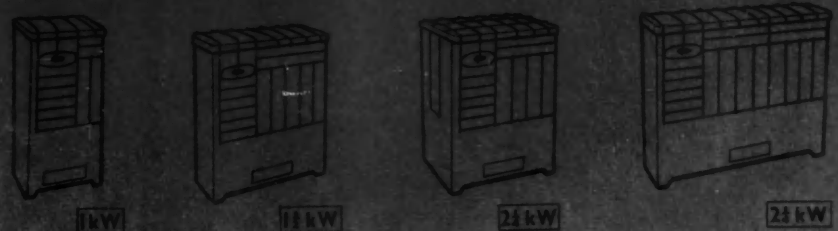
THE ONLY BRITISH MANUFACTURER OF ALL FOUR BASIC BEARING TYPES: BALL, CYLINDRICAL ROLLER, TAPER ROLLER AND SPHERICAL ROLLER

SKF

new Nightstor designs



Nightstor
HEATER
A
E&C
PRODUCT



Single-break Switchgear

FOR INDOOR SERVICE

Up to 2,500 MVA
From 22 to 66 KV
800/1200/1600 AMP.

The whole field of ratings normally required by service voltages from 22 to 66 kV is covered by Metrovick type SB metal-clad, single-break switchgear. These reliable oil-circuit breakers embody all the features proved by experience to be desirable in heavy switchgear service, including flexibility in operation, compact design, and ease of access for maintenance. They are available either as single or double busbar units, and are widely used by the C.E.G.B., and in other major plant installations.

For further details please write for descriptive leaflet 292/19–1

METROPOLITAN-VICKERS
ELECTRICAL CO LTD TRAFFORD PARK · MANCHESTER, 17

An A.E.I. Company

LEADING SWITCHGEAR PROGRESS

F/A801

Matched to your requirements

For screening, sorting or sifting heavy minerals or fine powders.
For filtering and processing liquids and semi-solids.
For restricting access and providing protection.
For improving presentation, the ornamental patterns add style and dignity to industrial design.

Please ask for Catalogue No. EL 858

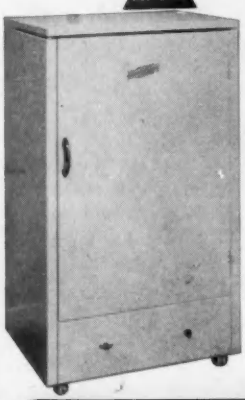
'Harco' Woven Wire

Harvey

G. A. HARVEY & CO. (LONDON) LTD.
WOOLWICH ROAD, LONDON, S.E.7
Telephone : GREenwich 3232 (22 lines)

It's no secret we're going on T.V.

AN APEX PRODUCT



Everyone will be talking- Be sure your stock will meet the demand.

This Clothes Drying and Airing Cabinet is made of heavy gauge rust proofed steel, with top and front opening to give unusually free access to clothes.
Absolutely safe. Finished in stove enamelled Cream or White. Retail Price £14. 4. 6. inc. Purchase Tax.

electrApex

ELECTRIC CLOTHES DRYING & AIRING CABINET

Approved by Electrical Authorities

LAMB HINGLEY & CO LTD
LYE, STOURBRIDGE, WORCS. PHONE: LYE 2361 (6 LINES)

An ideally handy flameproof

inspection handlamp

Neatly designed and robustly made of die-cast aluminium, the Type FHL 25 Inspection Handlamp is ideal for engine inspection and similar purposes. It is light in weight and fitted with a useful leather carrying strap.

FHL 25
- ★ Size 7½" × 4⅝" dia.
- ★ Wellglass and guard.
- ★ Cable gland.
- ★ Uses 25 watt. standard tubular lamp.

Send for Brochure giving particulars of approved electrical equipment.

SHIMWELL ALEXANDER & CO. LTD.
20 BEVIS MARKS, LONDON, E.C.3

INFRA-RED LAMPS — IRONS — KETTLES — ELECTRIC FIRES — BOILING RINGS — SPACE HEATERS — AIRING CUPBOARD HEATERS

REPLACEMENT ELEMENTS AND SPIRALS

METWAY SMART, SWIFTLY SELLING APPLIANCES —NOT SLOW SHELF STOCK!

"SUPERWAY" 600 watt Bowl Fire 18/6 plus 3/3 P.T. | "DANDYWAY" 750 watt Boiling Ring 19/8 No P.T. | "MIDGETWAY" 750 watt Electric Kettle 30/3 plus 6/6 P.T. | "FROSTAWAY" 25, 60 and 100 watt Heater 11/11 plus 2/7 P.T.

For more details of these and our other appliances ASK FOR OUR NEW APPLIANCES CATALOGUE No. DAR/10ER

METWAY WORKS · KEMPTOWN · BRIGHTON

INFRA-RED LAMPS — IRONS — KETTLES — ELECTRIC FIRES — BOILING RINGS — SPACE HEATERS — AIRING CUPBOARD HEATERS

REPLACEMENT ELEMENTS AND SPIRALS

STEEL **SHELVING**

72" HIGH
34" WIDE
12" DEEP

- *Brand new—Manufactured in our own works*
- *Shelves adjustable every inch*
- *Heavygaugeshelves will carry 400 lbs. each*
- *Stove enamelled bronze green*
- *6 shelves per bay—Extra shelves 8/- each*
- *Quantity discounts*

DELIVERED FREE
£3.15.0
Ready for Erection

N. C. BROWN LTD.
Rochdale Road Works
HEYWOOD · LANCS
—the manufacturers!

ALL OTHER SIZES available at equally keen prices.

Telephone:
Heywood 69018
(3 lines)

DOMESTIC SELF-PRIMING JET-PUMP

THE GODWIN TYPE J.1 JET PUMP has been designed primarily for domestic water supplies, either as pneumatic water system, or for pumping into an open tank.

- Self-Contained air cushion.
- Motor fitted with hand-reset overload protection device.
- No Stuffing box needing periodic attention.
- The same pump for Deep and Shallow Wells.

- There are no moving parts in the well.
- Maximum lift 50 feet.
- Compact—Only 16" diameter x 21" high.

Write for details from sole manufacturers

GODWIN *Pumps*

H. J. GODWIN
LIMITED
QUENINGTON
GLOS.

Phone: COLN ST. ALDWYNS 271 (6 lines)
Grams: "PUMPS, QUENINGTON"

HE'S A SPECIALIST
—SO ARE WE

The craftsman, by directing all his energies to one end, achieves perfection. In the same way, specialisation in Industrial Local Lighting Fittings produces lamps that are supreme in design and construction. E.D.L. lamps relieve eyestrain, increase operating efficiency, reduce costs.

E.D.L.

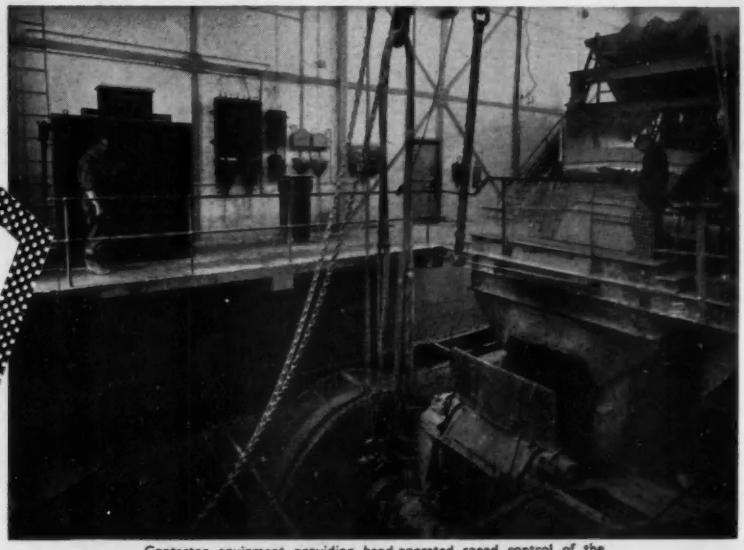
INDUSTRIAL LOCAL LIGHTING FITTINGS
for mains or low voltage

THE ELECTRIC DEPÔT LTD., Redbrook Lane, Brereton, Rugeley, Staffs. Phone: Rugeley 711

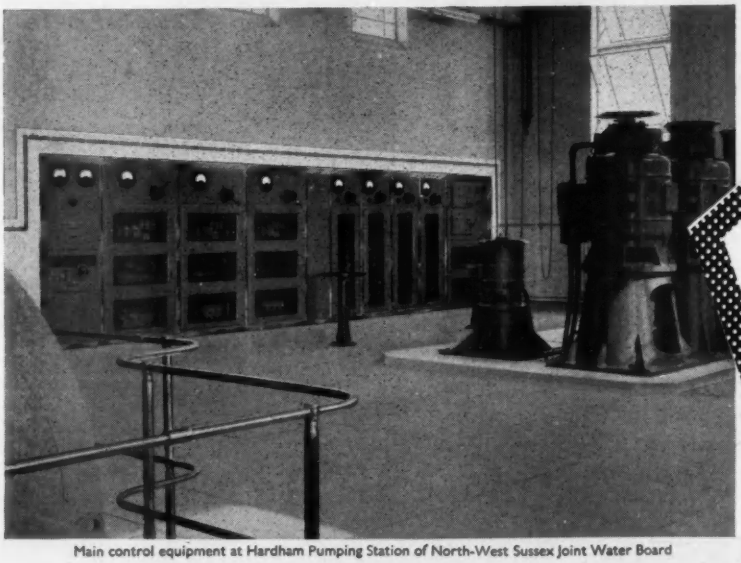
MOTOR CONTROL GEAR

for every industrial application

from the rigours of a Stone Quarry...



Contactor equipment providing hand-operated speed control of the Primary Crusher of Cornelly Quarry of The Steel Company of Wales Ltd



... to the elegance of a Pumping Station

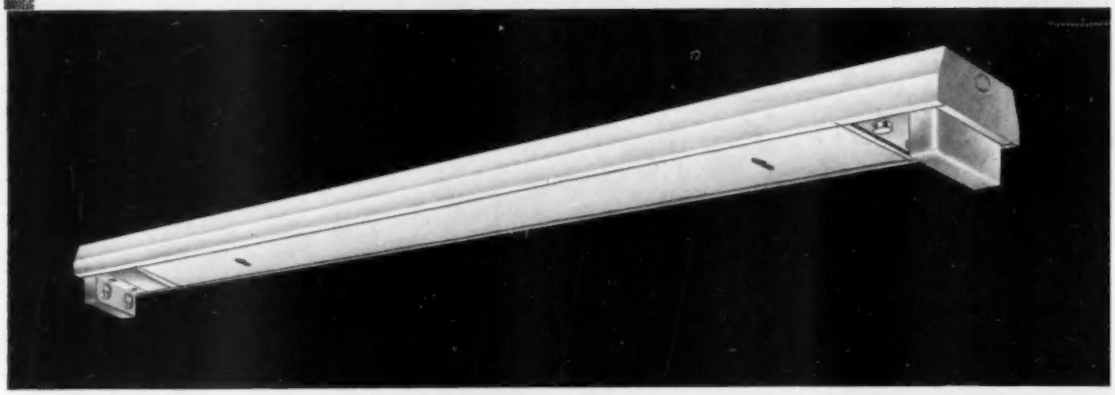
Main control equipment at Hardham Pumping Station of North-West Sussex Joint Water Board

For every electric motor there is an Allen West starter

ALLEN WEST

ALLEN WEST & CO LTD BRIGHTON ENGLAND · Telephone: Brighton 23291 · Telegrams: Control, Brighton
Engineers and Manufacturers of Electric Motor Control Gear and Switchgear
SUBSIDIARY COMPANIES IN CANADA, SOUTH AFRICA AND RHODESIA · AGENCIES THROUGHOUT THE WORLD

Announcing *The Revolutionary EKCO



Over 200 fluorescent fittings from this Basic Spine

4 ft., 5 ft. and 8 ft.—Single & Twin Tube

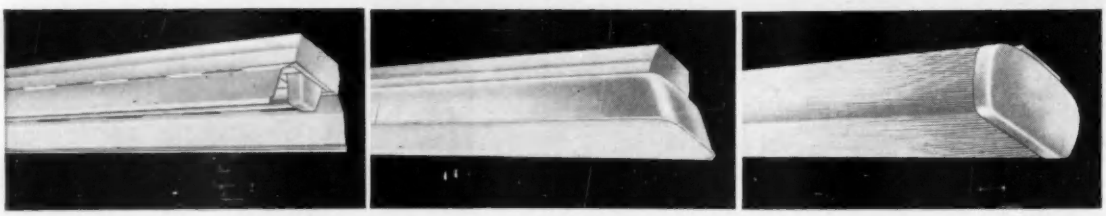
An entirely new range of Fluorescent Lighting Fittings, produced by experts with many years of experience, to combat the ever-rising costs of installation and maintenance.

The **Essex Range** prices are very competitive with those of any fittings of the same standard, but only the **Essex Range** has all the precision built-in refinements such as:—

Detachable control gear tray, quick-fix reflectors and diffusers, heavy duty bi-pin lampholders permitting lamping from one position, no projecting screwheads on spine, and many others.

Ask for a copy of the **Ekco Essex Range** Catalogue and see how good fluorescent lighting fittings can be.

- ***Installation and maintenance cost halved.***
- ***Assembly by one man in two minutes.***
- ***Full range of quick-fix metal and plastic reflectors with open or closed ends.***
- ***Modern diffusers with coloured endplates — quickly detachable for ease of maintenance.***



EKCO-ENSIGN ELECTRIC LIMITED

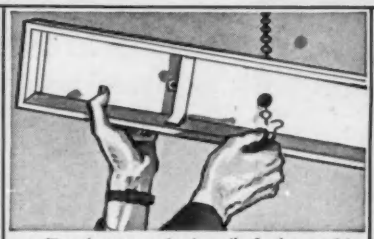
SALES OFFICES, ILLUMINATING ENGINEERING DEPTS., SHOWROOMS AND DEPOTS IN

Essex Range

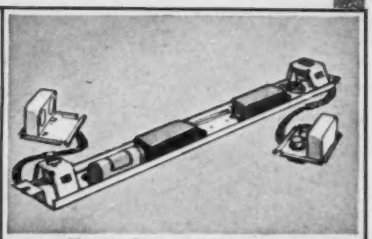
PATENT APPLIED FOR

Fluorescent Fittings

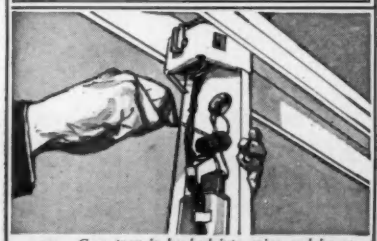
INSTALLATION & MAINTENANCE A ONE-MAN JOB!



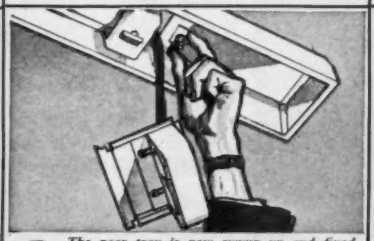
1 *First the empty spine is easily fixed to conduit, chain, universal suspension or ceiling. The 5ft. spine weighs only 7 lbs.*



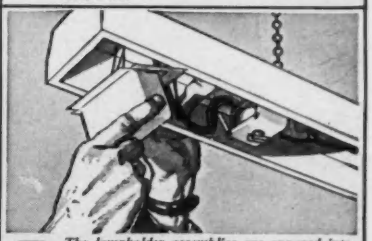
2 *The control gear tray is already wired complete with lampholder assemblies. The Switchstart tray for a single tube 80W. fitting weighs only 9 lbs.*



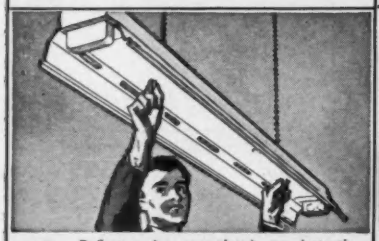
3 *Gear tray is hooked into spine and hangs vertically leaving both hands free to make connections.*



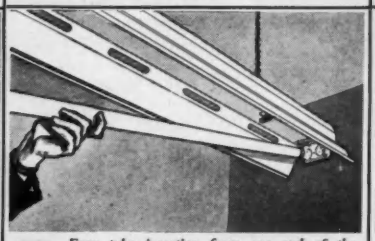
4 *The gear tray is now swung up and fixed securely in position by means of the captive wing nut.*



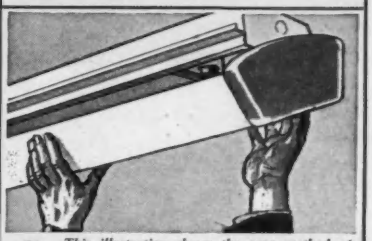
5 *The lampholder assemblies are engaged into the ends of the spine and slid into position. No screws or tools are required.*



6 *Reflectors (or coverplates) are instantly attached to the spine by two quick-fix turn-buttons.*

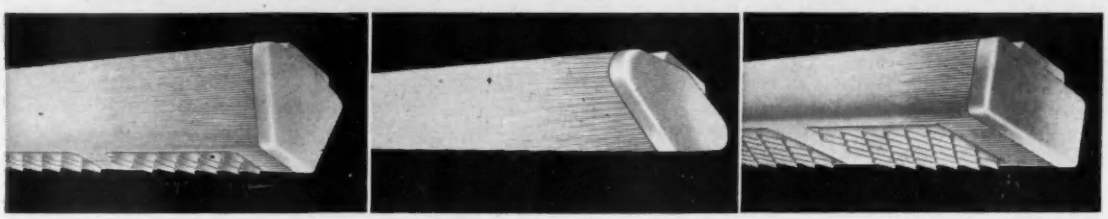


7 *Easy tube insertion from one end of the fitting. The fitting is now ready for use.*



8 *This illustration shows the easy method of diffuser attachment. A projecting coverplate is used, the diffuser is hung on to one side, is swung up and similarly engaged on the other side.*

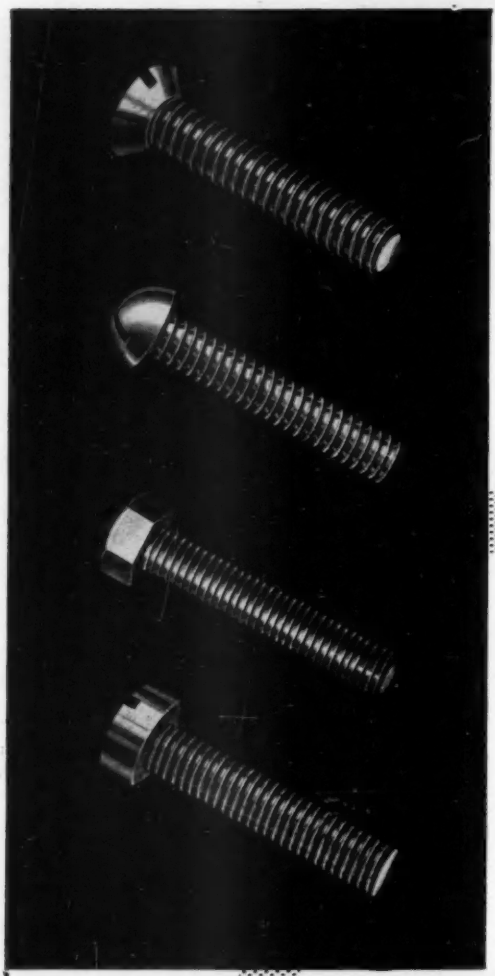
The Economy Range If price is your problem, then the **Economy Range** of Fluorescent Lighting Fittings provides the answer. Please turn to page 27 for details.



45 ESSEX STREET, STRAND, LONDON, W.C.2. TEL: CITY 8951

LONDON · MANCHESTER · BIRMINGHAM · NOTTINGHAM · GLASGOW · CARDIFF

EL59



Rolled Thread Screws

TAKE no chances about your supplies of Rolled Thread Screws—specify ORMOND and so make sure of both quality *and* quantity—delivered right on time and straight from our extensive stocks. Send for lists, which also detail Cut Thread Screws, immediately available. For your individual requirements we will gladly submit special quotations.

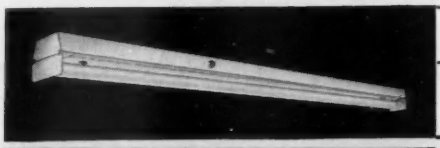
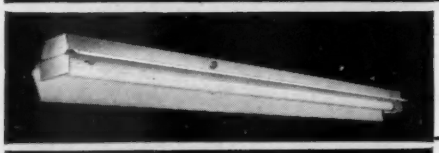
ENGINEERING "ORMOND" COMPANY LTD.

THE ORMOND ENGINEERING CO. LTD., Ormond House, Rosebery Avenue, London, E.C.1

Telephone : TERminus 2888 *Telegrams : "Ormondengi, Smith"*

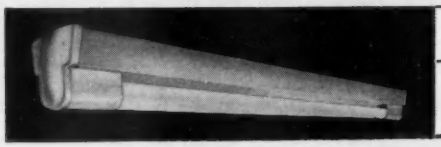
EKCO answers your cost problems with the Economy Range

Fluorescent Fittings *Complete with Tubes*

	Fittings	5 ft. Cat. Nos.	List Price incl. tube(s) & P.T.	4 ft. Cat. Nos.	List Price incl. tube(s) & P.T.
	Battens				
	Single	F51081	£ 6.10.0	F41081	£5.11.0
	Twin	F52081	£10.16.0	F42081	£8.15.0
	Reflectors				
	Single	F51082	£ 7.12.0	F41082	£6.12.0
		F51083	£ 7.12.0	F41083	£6.12.0
	Twin	F52082	£11.18.0	F42082	£9.16.0
		F52083	£11.18.0	F42083	£9.16.0
	Angle Reflectors				
	Single	F51088	£ 7.12.0	F41088	£6.12.0
	Twin	F52088	£11.18.0	F42088	£9.16.0
	Diffusers				
	Single	F51381	£13.14.1 incl. £1.16.9 P.T.	F41381	£12. 5.5 incl. £1.14.10 P.T.
	Twin	F52381	£18.13.7 incl. £2.4.11 P.T.	F42381	£16. 0.8 incl. £2.0.6 P.T.

Available in both single and twin tube, 4 ft. and 5 ft. sizes with Switchstart control gear.
Complete with either White or Warm White Tubes.

AND ALSO THE '035' BATTENS

	Cat. No.	Size	List Price incl. tube(s) & P.T.	Cat. No.	Size	List Price incl. tube(s) & P.T.
	F51035	5 ft.	£5. 5.0	F41035	4 ft.	£4.11.0
	F52035*	5 ft.	£9.13.0	F21035	2 ft.	£3.10.0

* This is the new twin tube fitting. All others in '035' Battens are single tube.

The list prices include fluorescent tube(s), purchase tax on tube(s) and on diffuser fittings where applicable.

EKCO-ENSIGN ELECTRIC LTD., 45 ESSEX STREET, STRAND, LONDON, W.C.2. Telephone: CITY 8951

Sales Offices, Illuminating Engineering Departments, Showrooms and Depots in

LONDON · MANCHESTER · BIRMINGHAM · NOTTINGHAM · GLASGOW · CARDIFF

EL. 61

Immediate delivery . . .

In addition to supplying cables of
every description to all parts
of the world we have in fact supplied
cables to the U.S.A. and to the U.K.
in connection with Intercontinental
and Intermediate Range Ballistic Missiles

WANDLESIDE CABLES *for every purpose*

WANDLESIDE CABLE WORKS LTD. 106 GARRATT LANE WANDSWORTH LONDON SW18

One of FALKS Group

Telephone: VANdyke 7544 (5 lines) Telegrams: Wandleside, London

WOOTTON
METER BOARDS

carry a load of responsibility and never let you down

and don't forget
WOOTTON wood blocks
sunk switch boxes
instrument cases

"You're never 'in a fix' if you fix Wootton Meter Boards — just the job for durable, reliable functioning under all climatic conditions. Yes sir! — they're as tough as you can make 'em!"

WOOTTON & CO. LTD. · ALMA WORKS · PONDERS END · MIDDLESEX · *Telephone: Howard 1858*

MOTOR COOLING & MOTOR ROOM VENTILATION

by

CYCLONE FANS AND FILTERS

For dust free cooling and ventilation of motors and electrical equipment in Steel Works and other heavy industries . . .

SPECIFY CYCLONE EQUIPMENT

MATTHEWS AND YATES LTD.

(Member of the Fan Manufacturers Association Ltd.)

HEATING AND VENTILATING ENGINEERS

SWINTON (MANCHESTER) AND 135 RYE LANE, PECKHAM, LONDON, S.E.15

Telephones: SWInton 2273 (4 lines) LONDON, New Cross 6571 (4 lines)

GLASGOW • LEEDS • BIRMINGHAM • BOURNEMOUTH • CARDIFF

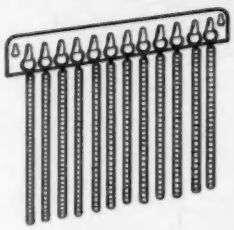
Snake
DISPENSER
for interlocking FERRULES

NOW AVAILABLE PACKED IN STRINGS FOR EASY HANDLING

Use the Hook Strip where several strings are in use at once.

Small extra cost more than saved by reducing time and loss of ferrules.

SNAKE dispensers are available in all sizes and markings.



★ SNAKE dispensers are sold ready filled with 50 Interlocking Ferrules.
★ Each Ferrule detached by simply pulling it off the string—no fumbling.
★ SNAKE dispensers occupy less space than storage trays.
★ Ferrules are held securely until required—no spilling on floor.
★ SNAKE dispensers are placed handy to wireman—no reaching over.

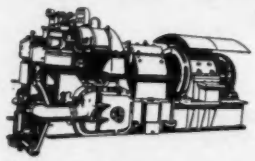
SEND FOR DETAILED PRICE LIST

CRITCHLEY BROS. LTD.
BRIMSCOMBE STROUD GLOS.
PHONE BRIMSCOMBE 2208/9

No. 1084

BROTHERHOOD

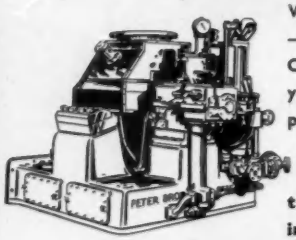
GENERATING SETS



Turbine driven up to 11,000 kW. Engine driven up to 340 kW.

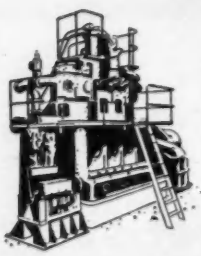
Scores in hand, hundreds in service.

BROTHERHOOD
VERTICAL AND HORIZONTAL
STEAM TURBINES
FOR DRIVING PUMPS, ETC.



Wide range — All types. Over 50 years experience. **Hundreds in hand—thousands in service.**

BROTHERHOOD
VERTICAL AND HORIZONTAL
COMPRESSORS



Air, Gas and Refrigerating. The widest range in the British Empire—made to suit your requirements. **Thousands in service.**

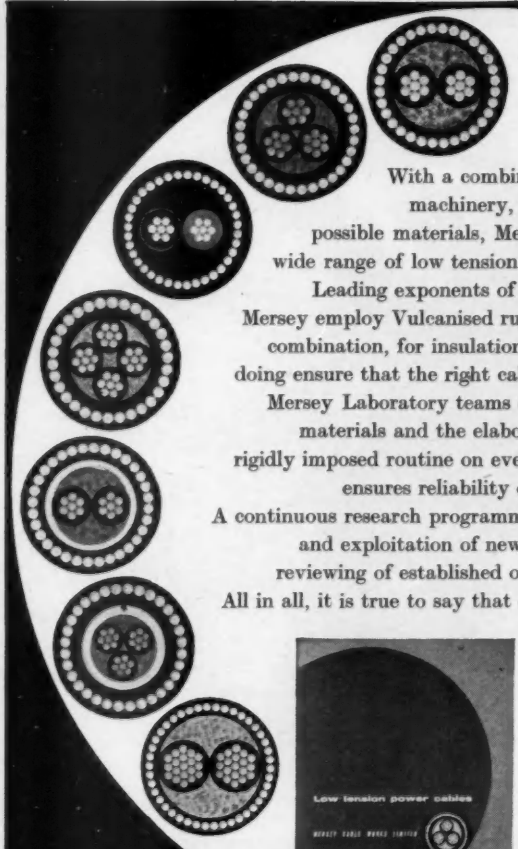
Also Manufacturers of all kinds of
PLANT TO CUSTOMERS' OWN DESIGNS
WHY NOT SEND YOUR PROBLEMS TO US?

PETER BROTHERHOOD
PETERBOROUGH ENGLAND
COMPRESSOR & POWER PLANT SPECIALISTS FOR NEARLY A CENTURY

P.1558

M M FROM MERSEY M

a complete range— of low tension power cables



With a combination of the most advanced machinery, infinite care, skill and the finest possible materials, Mersey produce a very wide range of low tension cables of the very highest quality. Leading exponents of modern cablemaking techniques, Mersey employ Vulcanised rubber, P.V.C. and Polythene, singly or in combination, for insulation and sheathing duties — and in so doing ensure that the right cable is available for each individual job. Mersey Laboratory teams check the quality standards of all raw materials and the elaborate step-by-step inspection, which is a rigidly imposed routine on every inch of Mersey Cable, ensures reliability of the finished product. A continuous research programme makes possible the early development and exploitation of new techniques and the constant reviewing of established ones in the light of new knowledge. All in all, it is true to say that only the best cables come from Mersey.

If you are concerned in the purchase of low tension cables, no doubt you would find the new Mersey catalogue most helpful. It contains a sectioned illustration and complete specification of each cable in the wide Mersey Range. Please request publication **No. 102A.**

MERSEY CABLE WORKS LTD LIVERPOOL 20 A TI COMPANY

MCW 13

DOMESTIC APPLIANCES

ONE ORDER...ONE

Morphy-Richards
Irons
from £2.8.1

Morphy-Richards
Hair Dryers
from £3.6.4

Morphy-Richards
Fires
from £2.11.1

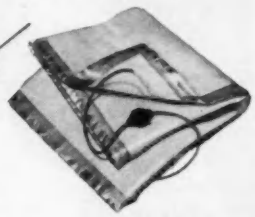
Morphy-Richards
Door Chimes
from £1.1.4

Morphy-Richards
Convectors
from £6.7.9

Morphy-Richards
Spin Dryers
from £28.10.6

Morphy-Richards
Ironers
from £33.15.2

Morphy-Richards
Toasters
from £6.8.4



Morphy-Richards
Blankets
from £3.7.6

. . . supplies at push-button readiness . . .

of all domestic electric appliances . . .

Extensive National Advertising will build up the public demand for these Morphy-Richards outstanding domestic appliances. Wise dealers will make sure of their supplies by ordering now.

Morphy-Richards
Super-Suction Cleaner
from £24.19.0

WINTER TRADING Co. LTD

6 HARROW ROAD, PADDINGTON, W.2

Telephone: PADdington 3646 (6 lines)

SERVICE ...ONE ACCOUNT...

FLUORESCENT AND ELECTRICAL FITTINGS

Are you stocked up

with these ATLAS 'popular' Lighting Packs? You're going to miss big business this Autumn if you haven't given this important part of your sales serious thought. You should get down to it now!

. . . ring for 5 Depot Service

All the five branches of the Winter Trading Company, strategically placed to give the widest possible coverage, are geared to provide the most efficient service with prompt delivery from stock, of a wide range of domestic appliances, fluorescent and electrical fittings and components. Prompt and accurate execution of your orders is our business and Radio and Electrical Dealers *really* get service from the Winter Trading Co.

BRANCHES AT

BIRMINGHAM: 58 Pershore Street. Phone: Midland 1920
CARDIFF: 31 Bridge Street. Phone: 21829
ILFORD: 118 Hampton Road. Phone: Ilford 6203
SOUTHAMPTON: 20 Bevois Valley Road. Phone: 24273

ATLAS 'POPULAR' PACKS

Prices complete with Tubes in 5 ft., 4 ft., and 2 ft. sizes are available for immediate delivery.

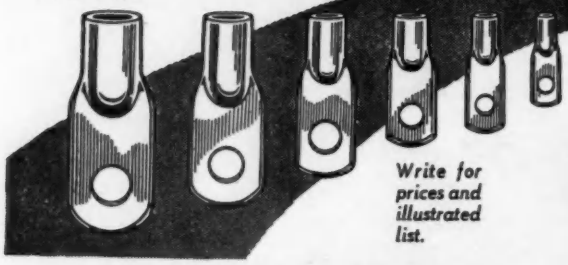
Size	*Rating*	*List Price*	*Purch. Tax*
		£ s. d.	s. d.
5 ft.	80 watt	5 2 4	2 8
4 ft.	40 watt	4 8 7	2 5
2 ft.	20 watt	3 14 10	2 2
ATLAS KITCHENLITE Type HK0041		2 17 3	12 5

Usual Trade Discounts.

USUAL TRADE DISCOUNTS

COLD METAL PRESSINGS MANUFACTURERS

1,000 amps.



Write for prices and illustrated list.

COPPER TUBULAR CABLE SOCKETS

15 amps.

DIPPED TINNED

B.E.S.A. Type No. 91–1930 No. 91–1954 X.L. Light Type

EXCELALL METAL WORKERS LTD.

Phone: Victoria 0297 **BIRMINGHAM 11** Grams: "Superpress"

TESTED TO 20,000,000 OPERATIONS

—that's *one* reason for choosing BROOKHIRST Snap Action Limit Switches—well-proved reliability. Other reasons: positive quick make and break changeover contacts, consistently accurate tripping, robust splash-proof or watertight enclosure.

For full information write for Leaflet 2103

BROOKHIRST | SNAP ACTION LIMIT SWITCHES

BROOKHIRST SWITCHGEAR LTD., CHESTER

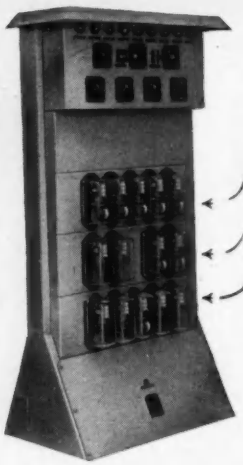
A METAL INDUSTRIES GROUP COMPANY CVS-62

JM **JOHN MORRIS**

ELECTRICAL ENGINEERING CO. LTD.

BILSTON TEL. 41237-8 STAFFS

CONTROL RELAYS



Type CR

Available as:– AC/DC Direct Acting or Time Delayed Models with up to five normally open and five normally closed contacts.

Ask for leaflet CR150453

A. PEARCE (BIRMINGHAM) LTD.

Morcom Road Works, Greet, Birmingham 11, England.

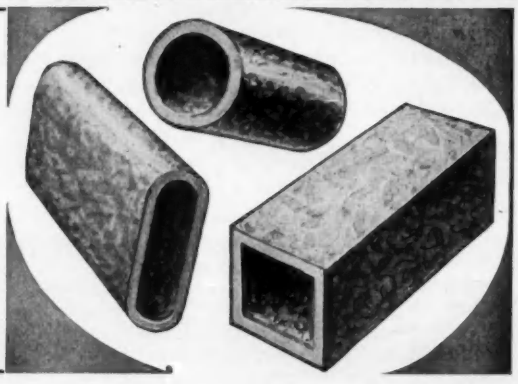
'Phone: Acocks Green 0102 Cables: Flexite, B'ham

Manufacturers of:-

INSULATING TUBES

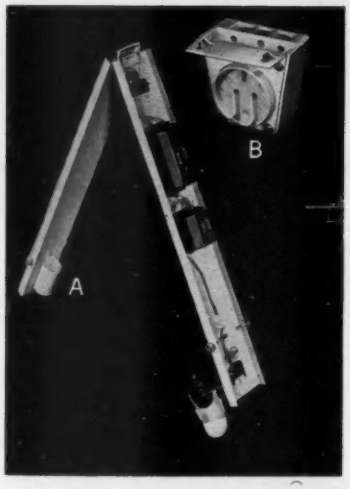
IN LENGTHS UP TO ONE METRE

Round tubes in Bakelite Paper, or Micanite.
Oval Tubes in Mica or Micanite.
Square Tubes in Bakelite Paper, Mica or Micanite.



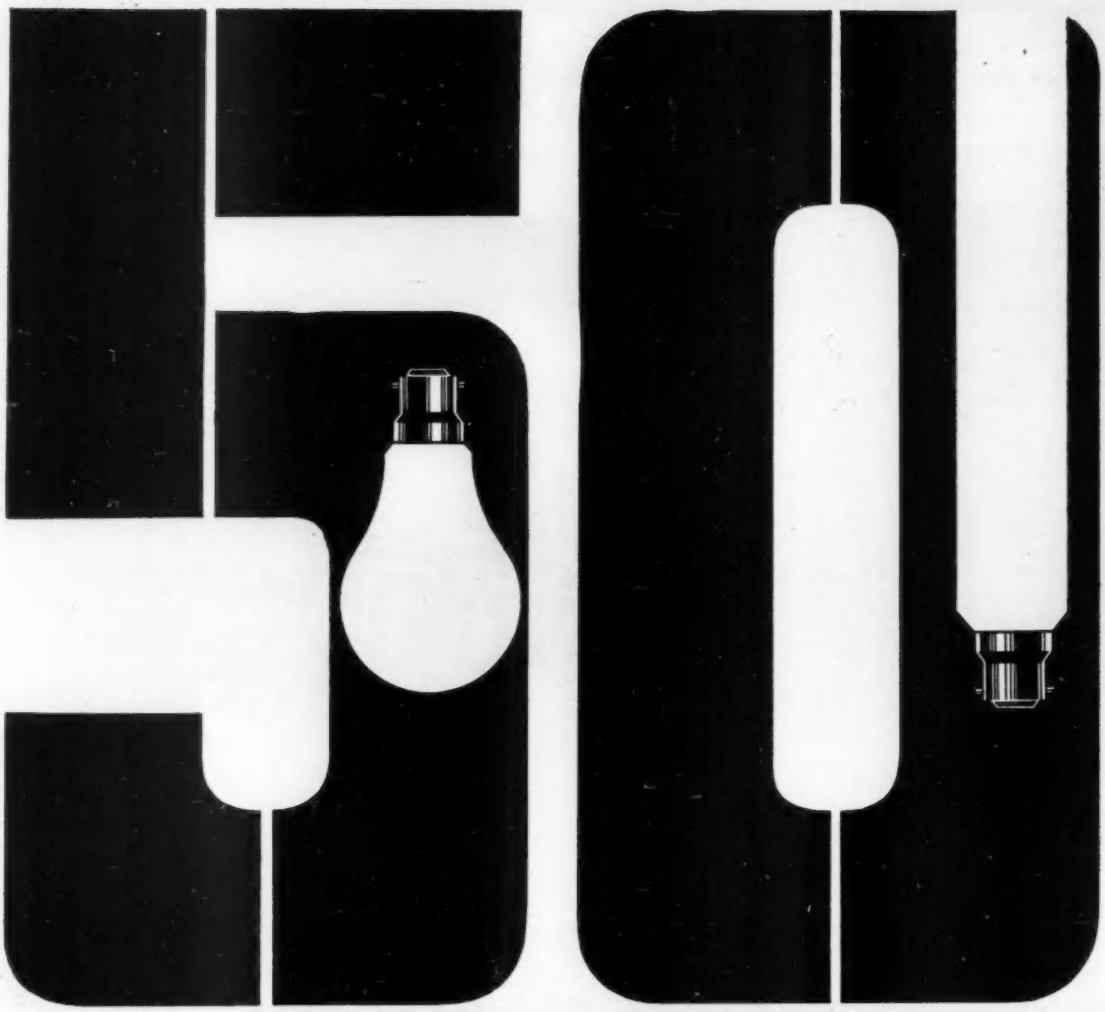
atlas leads in lighting / **suggestions for large industrial premises**

atlas trunking



Atlas Industrial Trunking provides an economical and completely flexible lighting system which is adaptable to any factory layout. Highly efficient 8 ft. or 5 ft. fluorescent fittings can be spaced at intervals or in continuous runs, as required, and once installed can be changed around without difficulty to meet changes of factory layout. Cables for lighting and power or communication services are carried within the trunking and can be easily tapped. Among other unique features which make Atlas trunking economical to install and maintain are the hinged gear trays (a) which can be unhooked and removed for servicing; and (b) Atlas Atlantic spring-loaded bi-pin lampholders which enable one man to relamp even 8 ft. fittings. Atlas Lighting Engineers are available for consultation at any time, and will gladly call by appointment.

ATLAS LIGHTING LIMITED A subsidiary company of Thorn Electrical Industries Limited 233 Shaftesbury Avenue London W.C.2.



50 years of bright selling

Elasta's Golden Jubilee represents an achievement in the field of high performance lighting. Homes, offices, factories everywhere are brighter with Elasta lamps.

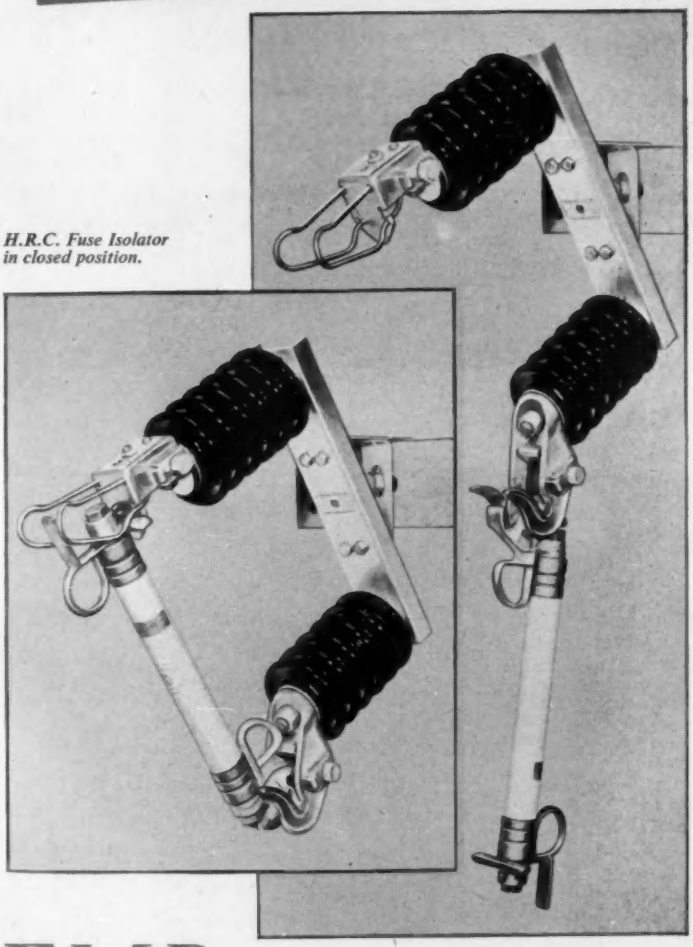
Tungsten Filament and Fluorescent

Elasta LAMPS

POPE'S ELECTRIC LAMP CO. LTD. *Head Office: CENTRAL HOUSE, 142 Central Street, London, E.C.1*

Telephone: CLErkenwell 2402-5 Telegrams: DURAMENTUM CENT LONDON

High Voltage DROP OUT
LOAD BREAKING FUSE CUT-OUT
for all systems up to 33 kV



H.R.C. Fuse Isolator in closed position.

H.R.C. Fuse Isolator after operation.

The EMP Fuse Switch is a combination of an Expulsion Fuse or H.R.C. Fuse

ECONOMY

EMP Expulsion Fuse cut-outs *for fault "BREAKING" up to 3,000 amps R.M.S.*

SAFETY in SERVICE

Fault "MAKING" only with **Current Limiting H.R.C. Fuse** *for all fault duties.*

Service continuity ensured by surge resistance of H.R.C. Fuse to lightning transients

Details of tests to B.S.2692 submitted on request.

EMP ELECTRIC LTD.

GARMAN ROAD, TOTTENHAM, LONDON, N.17. *Tottenham 5591 (5 lines) Grams: "Arrester London"*

B

Field & Grant
LIMITED

ELECTRICAL
AND REMOTE
CONTROL EQUIPMENT

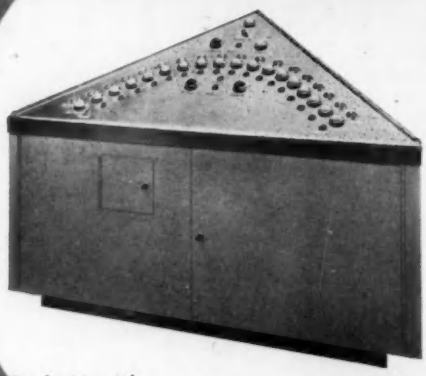


Illustration by courtesy of Messrs. William Douglas & Sons Ltd.

Tailor made to YOUR specification or engineered and designed for YOU

★ LET OUR ENGINEERS HELP TO SOLVE YOUR CONTROL PROBLEMS

Get to know us at—

KENT STREET.
BIRMINGHAM 5.

Telephones: MIDLAND 5675-6
LONDON. HARROW 5578

Field & Grant
BIRMINGHAM

The mark of the Specialists

HEAVY DUTY
PATENT 'T.A.'

This patent bayonet holder will operate continuously at 10 amps with safety, and will reduce maintenance charges. Specially designed for Railway conditions.

LAMPHOLDER

SPERRYN

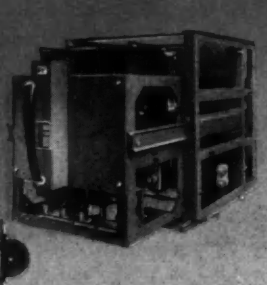
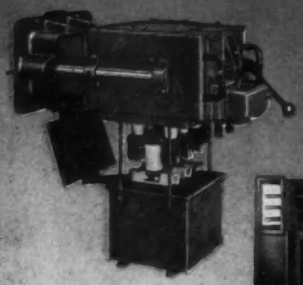
SPERRYN & CO. LTD., MOORSOM ST., BIRMINGHAM 6

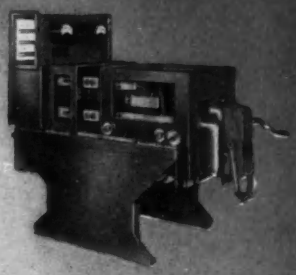
Telephone: ASTon Cross 4011 (5 lines)

LONDON ADDRESS: 23 GREAT SUFFOLK ST., LONDON, S.E.1 TELEPHONE: WATERLOO 6418

CIRCUIT BREAKERS

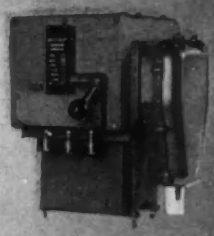
for use on LV *systems*



AIR BREAK—A C & D C

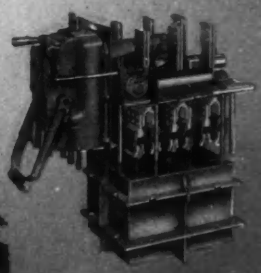
Open type—front panel mounting
Dead front—back of panel mounting
Metal enclosed
Marine type to Lloyds requirements
DC Traction
Field Breakers with discharge contacts
Horizontal draw-out
Admiralty shock-proof
H.R.C. Types ASTA tested to BSS 116-1952



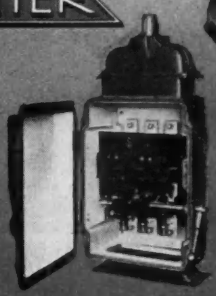
OIL IMMERSED — A C

up to 2000 amps
Industrial Metalclad—non draw-out
Metalclad Horizontal draw-out
Panel Mounting

A very wide range of types and sizes to meet most requirements at competitive prices.



STATTER



Specialists in Switchgear for over 50 years

J. G. STATTER & CO. LTD.

82 VICTORIA ST., LONDON, S.W.1. Telephone: TATe Gallery 0436. Telegrams: SWITCHONIA, LONDON
WORKS — AMERSHAM COMMON, BUCKS

Member of Lancashire Dynamo Group

THEY SET A STANDARD

OVER 1500 years ago the Romans built the roads whose names are still familiar to us—Fosse Way, Watling Street, Icknield Way, Ermine Street and many others. Often following tracks old before the Romans came, these broad, straight roads provided vital communication for the legions, and for the administrators and merchants who followed in their steps. In road building, as in many other fields, the Romans set a standard which few have equalled since.

In cable making, too, standards are of vital importance. For over 100 years members of the Cable Makers Association have been concerned in all major advances in cable making. Together they spend over one million pounds a year on research and development. The knowledge gained is available to all members. This co-operation has contributed largely to the world-wide prestige that C.M.A. cables enjoy, and it has put Britain at the head of the world cable exporters.

Technical information and advice is freely available from any C.M.A. member.

Roman legionaries on the march.

MEMBERS OF THE C.M.A.

British Insulated Callender's Cables Ltd · Connollys (Blackley) Ltd. Enfield Cables Ltd · W. T. Glover & Co. Ltd · Greengate & Irwell Rubber Co. Ltd · The Hackbridge Cable Co. Ltd.* W. T. Henley's Telegraph Works Co. Ltd · Johnson & Phillips Ltd. The Liverpool Electric Cable Co. Ltd · Metropolitan Electric Cable & Construction Co. Ltd · Pirelli-General Cable Works Ltd. (The General Electric Co. Ltd.) · St. Helens Cable & Rubber Co. Ltd. Siemens Edison Swan Ltd · Standard Telephones & Cables Ltd. The Telegraph Construction & Maintenance Co. Ltd.

* *C.M.A. Trade Marks for Mains Cables only*

Insist on a cable with the C.M.A. label

The Roman Warrior and the letters 'C.M.A.' are British Registered Certification Trade Marks.

CABLE MAKERS ASSOCIATION

CABLE MAKERS ASSOCIATION, 52-54 HIGH HOLBORN, LONDON, W.C.1. TELEPHONE: HOLBORN 7633 CMA 23

Every Monday morning the Delanco team get their playing orders for the week. *The aim?—to be top of the league for service, to make* every point tell in the interests of the customer.

Every man in the team knows his particular job, and when the opposition in the shape of a difficult job is formidable they combine together to beat it.

We have a very loyal crowd of supporters—*maybe you are one*—in fact, any buyer who uses Electrical Insulation Materials *is one.*

Don't put us on your coupon, go one better and include us on the list of your dependable suppliers—you'll get a worth while dividend in the shape of better service, first class quality and the best work that only true craftsmanship can achieve.

Send for our programme—it's the Delanco catalogue. Free for the asking.

Anglo-American Vulcanized Fibre Co. Ltd

CAYTON WORKS BATH STREET LONDON E.C.1. CLE 3271 Grams: PROMPSERV, LONDON AVE,

DELANCO WORKS • LEONARD STREET • LONDON E.C.2

VULCANIZED FIBRE • LAMINATED BAKELITE
PRESSBOARD • PRESSPAHN • CLOTHS, TAPES AND SLEEVINGS

Delanco Electrical Insulation

LEATHEROID • MICA • COMPOSITE INSULATIONS
EBONITE • PRESSED, TURNED AND MACHINED COMPONENTS

Patent applied for

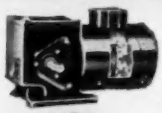
NEW TYPE DR GEARED MOTOR

Type DR geared motors have ball bearing oil-immersed worm and wheel, with additional spur reductions. Motors of 1/6, 1/4, 1/3 or 1/2 h.p., for 3 phase, single phase or D.C. supplies, are fitted to the one-piece cast-iron gearbox. Final shaft speeds are from 15.6 r.p.m. to 305 r.p.m. Speeds down to 0.05 r.p.m. with a maximum torque of 100 lb.-ft. are available.

right-angled geared motors

NECO right angle drive geared motors are units of compact design especially suitable for applications where space is limited. There is a wide range of output speeds and gearing is by worm, or worm and spur reduction, according to type of unit.

TYPE SW 1/8 h.p. motors, 3 phase, single phase, or D.C., final shaft speeds between 270 r.p.m. and 0.055 r.p.m. Maximum output torque is 25 lb.-ft. below 14.8 r.p.m.



TYPE W 1/8, 1/4 or 1/3 h.p., 3 phase, single phase, or D.C. Final shaft speeds from 270 r.p.m. down to 90 or 45 r.p.m. according to output.

NECO TRADE MARK

geared motors

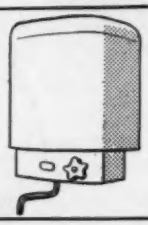
NECO GEARED MOTORS LTD

204 QUEENSTOWN ROAD · LONDON · S.W.8
Telephone: MACaulay 3211-4

Subsidiary of Normand Electrical Company Limited

Wherever

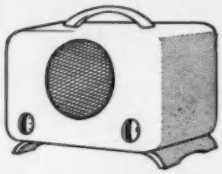
heat



control

matters

there's



an **Otter** **THERMOSTAT**

The SIMPLEST and most RELIABLE of all safety switches

Otters press their contacts together to open them with a "SNAP"

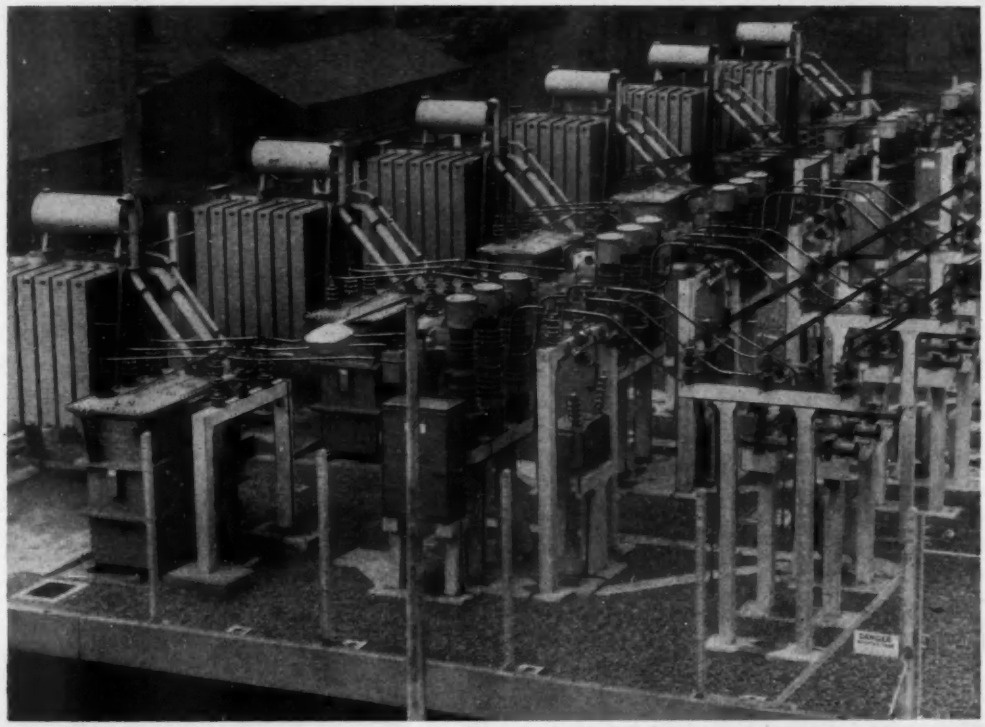
OTTER CONTROLS LTD

Otters 'ole, Market Street, Buxton, Derbyshire

Phone: Buxton 650 (2 lines)

FERRANTI TRANSFORMERS for ROLLS-ROYCE DERBY

Six 15 MVA 33/11 kV 3 Phase 50 cycles 'ON' Ferranti Transformers have been installed at Rolls-Royce Limited, Derby for the purpose of supplying power to the Aero Engine High Altitude Test Facility (Consulting Engineers, McLellan & Partners in association with Merz and McLellan).



A view of the installation at Rolls-Royce Limited, Sinfin, Derby.

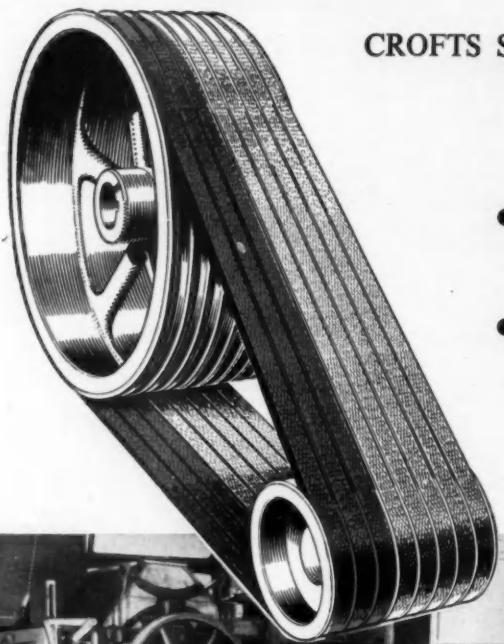
Specify **FERRANTI** *transformers famous throughout the world*

FERRANTI

FERRANTI LTD · HOLLINWOOD · LANCS *Telephone*: FAllsworth 2000
London Office: KERN HOUSE, 36 KINGSWAY, W.C.2. *Telephone*: TEMple Bar 6666

V-dr

CROFTS MAKE



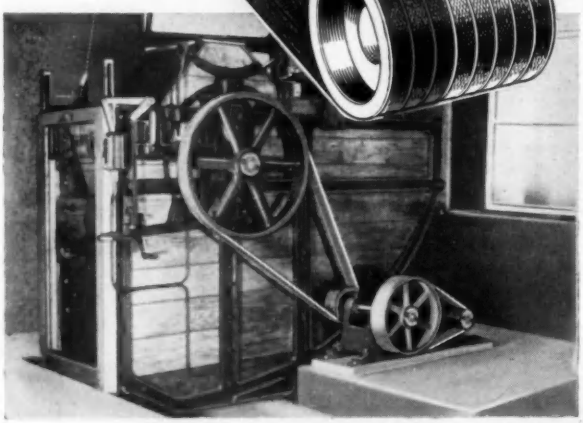
CROFTS SUPROR SURE-GRIP V-ROPE DRIVES

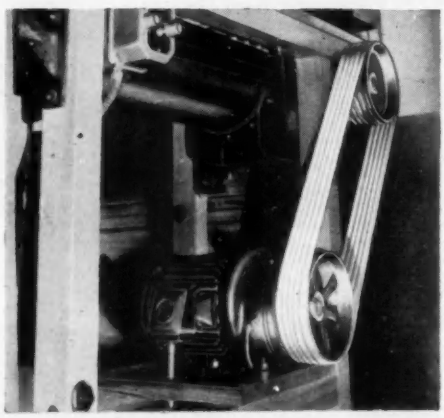
Standard drives up to 950 h.p. Ratios up to 8 : 1.

Publication 156

- premium grade ropes give 25 to 75% more power, yet retain long-life durability
- pulleys supplied with either parallel-bored and keywayed or fitted with quick-change Crofts Patent Taper-Flushbush

drives up to 150 hp from stock





These applications are typical examples of the adaptability of Taper-Flushbush V-rope Pulley drives

CROFTS (ENGINEERS) LIMITED

POWER TRANSMISSION ENGINEERS

Head Office: Thornbury Bradford 3 Yorkshire

Telephone: 65251 (20 lines) Telegrams: "Crofters Bradford Telex" Telex 51186

Branches at:

Belfast Birmingham Bristol Cardiff Dublin Glasgow Ipswich Leeds Liverpool London Manchester Newcastle Northampton Nottingham Sheffield Stoke-on-Trent

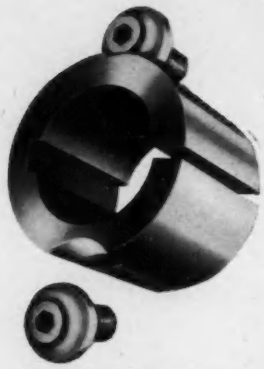
ives

THE FINEST YOU CAN BUY

CROFTS PATENT TAPER-FLUSHBUSH

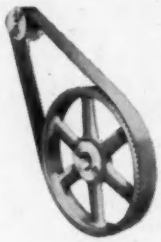
⅜" to 4½" bore from stock

Publication DM15



- Easy to fit or remove
- interchangeable bushes to fit a wide range of shafts
- many sizes of Crofts pulleys, chain sprockets and flexible couplings are fitted with the Patent-Flushbush.

You can buy the bush to fit to your products or we can supply it in a hub ready to weld on to your conveyor drives etc.



Powergrip "geared belt" Drives

Fractional to 300 h.p. precision positive drive: speeds from inches per minute to 16,000 f.p.m. without slip

Send us your enquiries

Roller Chain Drives

Sprockets with Taper-Flushbush or parallel bore, single, duplex and triplex drive to 120 h.p.

Send us your enquiries

Makers of:

Clutches, Conveyor drives, Couplings of all types, Double helical gear units, Fabricated steelworks, Geared motors, Hydraulic couplings, Iron, steel and non-ferrous castings, Machine-cut gears of all types, Motorised rollers, Patent Taper-flushbushes. Plummer blocks, Shaft-mounted gear units, Special machinery drives, Spiral bevel gear units, Turbine gears, V-rope drives, Variable speed drives, Worm reduction gears.

CROFTS (ENGINEERS) LIMITED

POWER TRANSMISSION ENGINEERS

Head Office: Thornbury Bradford 3 Yorkshire

Telephone: 65251 (20 lines) Telegrams: "Crofters Bradford Telex" Telex 51186

Everything has to be

CONTROLLED

your nights out,

your smoking,

your drinking,

and . . . maybe

your mother-in-law ? ? ?

but . . .

to control electricity

SANDERS

The mark of superiority in Switch and Fusegear.

WM. SANDERS & CO. (WEDNESBURY) LTD.
FALCON ELECTRICAL WORKS,
WEDNESBURY, STAFFS.

Clips FOR THE ELECTRICAL TRADE

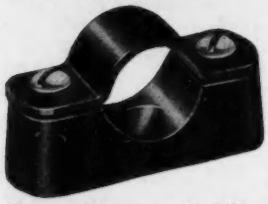
WE are the 'clip people.' We make conduit clips and hooks for every purpose, both to standard patterns and to special designs for particular requirements. If you have a *CLIP* problem please get in touch with us NOW.

FREE Catalogue and Price List on request.

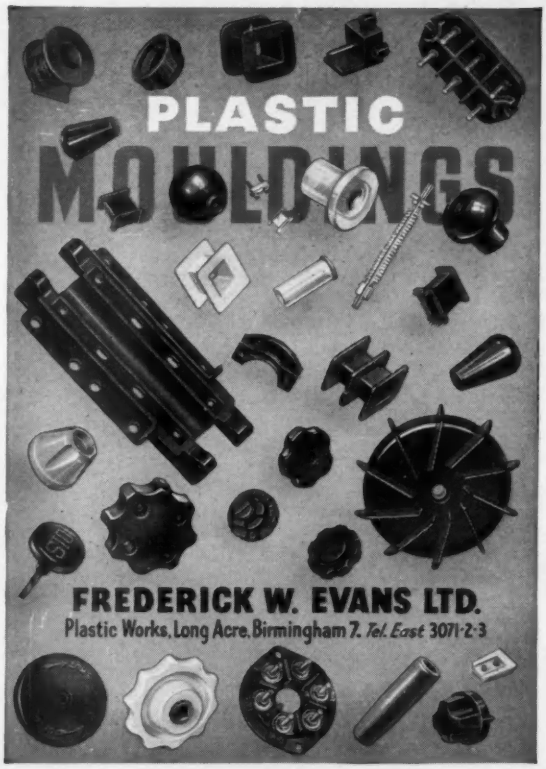
LONGBOTTOM & Co. (Keighley) Ltd
Dalton Mill, Dalton Lane
Keighley, Yorks
Telephone : Keighley 4007
Grams : Resurgam, Keighley

"The Clip People"

Copper Earth Clip — for pipes ¼" to 2" diameter.



Heavy Distance Saddle— enamelled and galvanised — for pipes ⅜" to 2" diameter.



ESSENTIAL

for sampling and monitoring

HENDREY

MERCURY VAPOUR CONCENTRATION METER Type E.3472

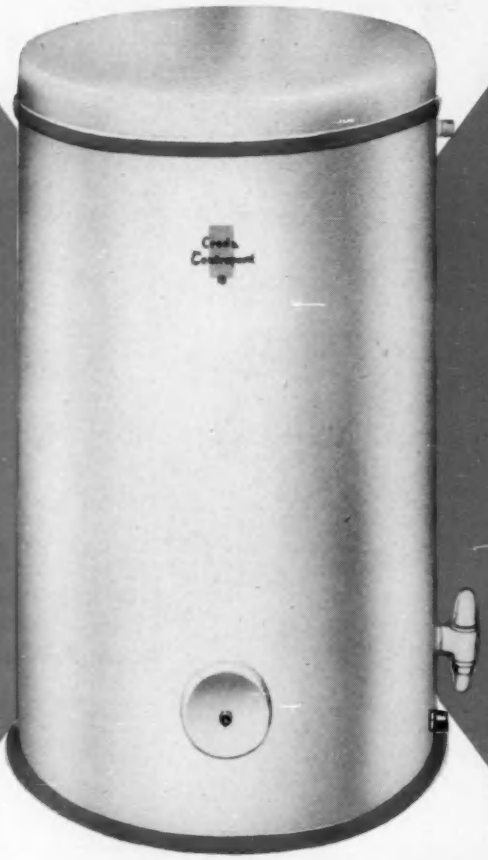
Measures concentration of mercury vapour present in air. Essential where quantities of mercury are regularly used or where danger exists of leakage of mercury vapour from apparatus.

Two sensitivities are available, at the touch of a switch, giving either full scale reading at a concentration of 770 micro-grammes per cubic metre of air or full scale meter reading at a concentration of 200 micro-grammes. Terminations are provided at rear for operation of a recorder to give continuous readings of of concentration present.

Hendrey Relays

HENDREY RELAYS LTD. - BATH ROAD SLOUGH BUCKS.
Telephone: Burnham 6091611
MANUFACTURING ELECTRICAL ENGINEERS - CONTROL AND LABORATORY APPARATUS. On Admiralty, Principal Ministries and Post Office Lists. A.I.D. and A.R.B. Approved.

It's the Creda Centrepoint!



Big news on the electric water-heating market—the brilliant new Creda CENTREPOINT!

Big news because here's a simple, efficient water-heater that supplies the whole house from a Centrepoint

And it's styled as the Centrepoint of the modern kitchen

No need to 'hide' the Creda Centrepoint No need to build it in. Easy to install near the tap in most common use and cut pipe losses to a minimum. It's clean, uncluttered, handsome and colourful

Fits in anywhere. Only 33" high —so the Creda Centrepoint can go under the draining board or become part of a unit-built suite

Full thermostatic control, of course. Really efficient insulation. In fact, a typical Creda—a job you can be sure of

And the price! Just about the lowest!
in white or cream, £27 plus £6.6.5 pt
in Creda matching-suite colours turquoise, blue or green £28.7.0 plus £6.12.8 pt

all finishes with red trim

STOCK UP NOW

with another world-beater from Creda

Write for sales and technical leaflets

Creda CENTREPOINT

20 GALLON 3 kW ELECTRIC WATER-HEATER

SIMPLEX ELECTRIC CO LTD CREDA WORKS BLYTHE BRIDGE STAFFS
LONDON SHOWROOMS: CREDA HOUSE BINNEY STREET W1
CO 282 CC 203

A (17) COMPANY

LATEST PRODUCT

from EG

'H' SERIES RELAY

This is a smaller version of the well-known MK 11 Relay and is available from 3 amp. T.P. to 30 amp. S.P. contact rating. The unit is especially suitable where space is limited, the overall dimensions being $3\frac{3}{16}'' \times 3'' \times 2\frac{1}{4}''$.

Various types of mountings are available.

Mercury Switch Contacts are provided ensuring silent and reliable operation requiring NO SERVICING.

THIS SIMPLIFIED RELAY IS THE MOST ECONOMICALLY PRICED FOR ITS RATING ON THE MARKET.

Other products include :

COMPLETE CONTROL PANELS · PLUG-IN RELAYS · CONTACTORS FROM 15 TO 150 AMP · CONTACT THERMOMETERS · MERCURY SWITCHES · MINIATURE TELEPHONE RELAYS · MOTOR STARTER UNITS · MOTOR REVERSING UNITS · VOLTAGE AND CURRENT RELAYS.

OUTSTANDING FEATURES –

- ★ SMALL SIZE
- ★ SILENT OPERATION ON AC OR DC
- ★ LONG LIFE MERCURY CONTACTS
- ★ ECONOMICALLY PRICED

ENGEL & GIBBS LTD

WARWICK RD · BOREHAM WOOD · HERTS · ELSTREE 2291 (5 lines)

NOW

BRENTFORD GREEN SEAL

goes down the pit

A **NEW** SAFETY MINING TRANSFORMER

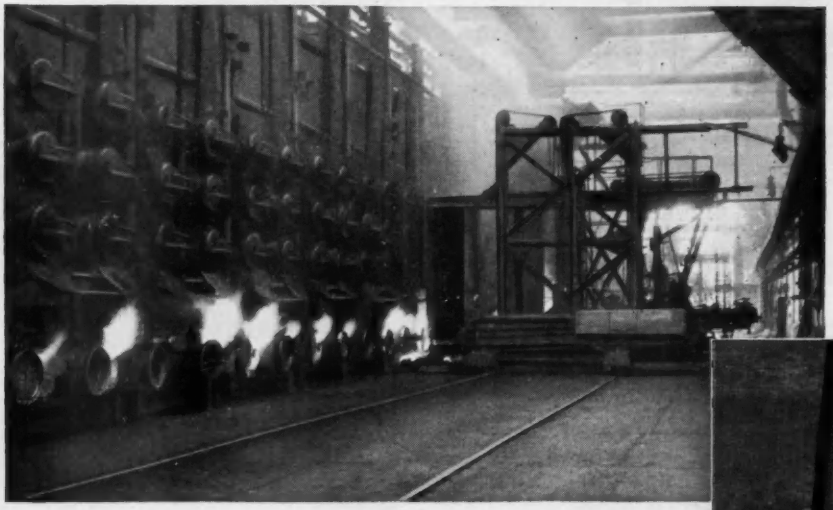
- Insulated with Class H material.
- Transformer totally enclosed in a sealed tank filled with nitrogen.
- Voltage ratio 3150/525-420 volts, 150 kVA.
- Requires minimum maintenance.

SAFE •HIGH TEMPERATURE PERFORMANCE •FIREPROOF •DUSTPROOF

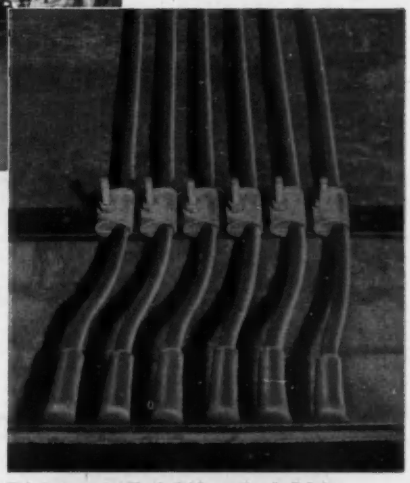
This is the first transformer of its kind in service with a Division of the NATIONAL COAL BOARD

BRENTFORD MINING TRANSFORMERS

BRENTFORD TRANSFORMERS LIMITED • MANOR ROYAL • CRAWLEY • SUSSEX Telephone : Crawley 25121



A view of the Retort House in the Greenwich Works of the South Eastern Gas Board. Runs of Telcon Armoured Plastic Cable are installed on the wall facing the retorts.



Telcon Armoured Plastic Cables serving the lighting system in the Retort House at the Greenwich Works of the South Eastern Gas Board. The terminations at the switch boxes are protected by Telcon PVC Sleeves.

Telcon Armoured Plastic Cables

Telcon Armoured Plastic Cables have proved to be the most economic types for installation under the most adverse and punishing industrial conditions. The illustration shows a view of the Retort House in the extensive works of the South Eastern Gas Board at Greenwich, where Telcon Armoured Plastic Cables and Glands have demonstrated their capacity to provide fault-free service in this exceptionally corrosive atmosphere.

The whole of these works in which all the chemical by-products of coal are manufactured—including sulphuric acid and sulphate of ammonia—is rapidly being re-wired with Telcon Armoured Plastic Cables. A higher testimonial to their efficiency, reliability and overall economy could hardly be produced.

The elimination of a lead sheath allows for a simple jointing and terminating technique, while their comparative lightness also makes for ease of transportation and speed and neatness in installation. A complete range of terminating glands specially designed for these cables is available.

You are invited to write for further details, quoting reference E.J, to:—

THE TELEGRAPH CONSTRUCTION & MAINTENANCE CO. LTD

Sales Dept., Telcon Works, Greenwich, London, S.E.10. Tel: Greenwich 3291

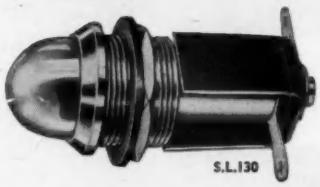
Branches: Cardiff • Dudley • Manchester • Newcastle • Nottingham

Arcolectric Signal Lamps

S.L.100

S.L.160

S.L.162


S.L.130

Neon for 80-600 volts

S.L.160 and **S.L.162 :** New miniature low cost neon signal lamps. ¼" hole fixing. Completely sealed against moisture.

Low Voltage

S.L.130 : New high quality design for M.B.C. (M.C.C.) bulbs.
Also available with neon.

Mains

S.L.100 : For B.C. sign lamps.
S.L.170 : For S.B.C. lamps.

Samples of any of above three new products to manufacturers for design purposes AT ONCE—WITHOUT CHARGE—on request

Write for Catalogue No. 131

ARCOLECTRIC SWITCHES · LTD

CENTRAL AVENUE, WEST MOLESEY, SURREY. Tel.: MOLESEY 4336

ATLAS

STEEL CASTINGS

For Internal Pressure Work

Turbine Casings, Steam Chests, Valves, etc., in carbon and alloy steels up to nine tons weight and to any specification.

ON ADMIRALTY, WAR OFFICE, LLOYD'S and other LISTS.

THE ATLAS STEEL FOUNDRY & ENGINEERING COMPANY, LIMITED

ATLAS STEEL WORKS: ARMADALE, WEST LOTHIAN, SCOTLAND

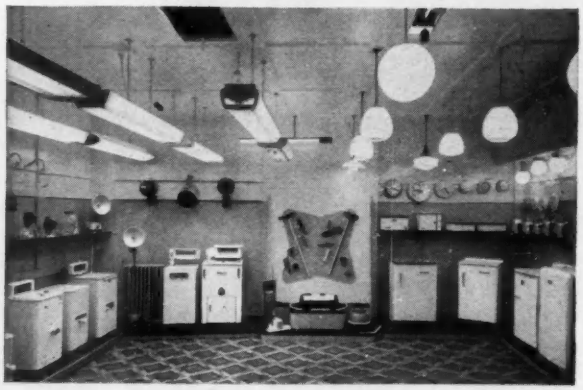
Telegrams: "Atlas Armadale, West Lothian." Telephone No.: Armadale 323

The 'SUN' rises on a new era of service

SUNCO
Trade Mark

The new Trade Counter designed for speedier service

The new Domestic Appliances Showroom.



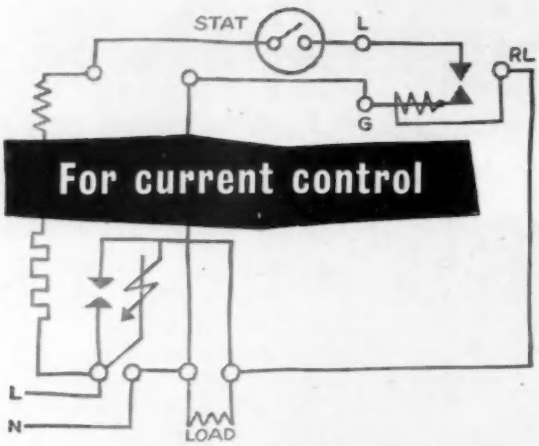
This new building with greatly improved facilities represents another step forward in the "Sunco" tradition of unsurpassed service to the electrical Contractor and Retailer.

Our completely rebuilt showrooms were opened on September 29th 1958, to exhibit the latest Appliances and Heaters, Lighting Fittings and Industrial Electrical Equipment.

THE SUN ELECTRICAL CO. LTD.

118-120 CHARING CROSS ROAD, LONDON, W.C.2
Telephone: TEMple Bar 3500 (18 lines)

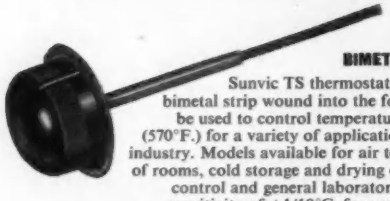
Branches at
Leeds, Newcastle-on-Tyne,
Guildford, Slough, Wembley



...SPECIFY SUNVIC

Sunvic components are widely used for controlling equipment such as moulding presses, furnaces, incubators, chemical plant, etc. Together with the Sunvic potentiometric recorder they also have numerous applications in scientific and industrial research particularly for measuring, controlling and recording temperature and small electrical quantities.

If you have a specific problem or would like technical information on any or all Sunvic components, please contact Sunvic Controls Ltd., P.O. Box 1, Harlow, Essex. Tel: Harlow 25271.



ADJUSTABLE BIMETAL THERMOSTATS

Sunvic TS thermostats are operated by a bimetal strip wound into the form of a helix. Can be used to control temperatures of up to 300°C. (570°F.) for a variety of applications in research and industry. Models available for air temperature control of rooms, cold storage and drying chambers, for oven control and general laboratory work, and with a sensitivity of ±1/10°C. for very accurate control.

ENERGY REGULATORS

The Sunvic energy regulator effects its control by periodically switching on and off the power, the ratio of the on-time to the total time determining the average power input, which is continuously variable. Available in several forms with a continuous rating of 1kW at 230V. A.C.; also supplied with an HVS relay for larger loads.

HOTWIRE VACUUM SWITCH (HVS) TUBES AND RELAYS

Available either as a loose tube for switching up to 10 kW at 400V. A.C. or D.C. or as a complete relay either enclosed in a plastic box or mounted on a paxolin base for incorporation in customer's own equipment. For single—or three-phase A.C. applications. Advantages are: no arcing; silent operation; low, non-inductive operating current; A.C. or D.C.; inductive or non-inductive loads.

SUNVIC

An A.E.I. Company

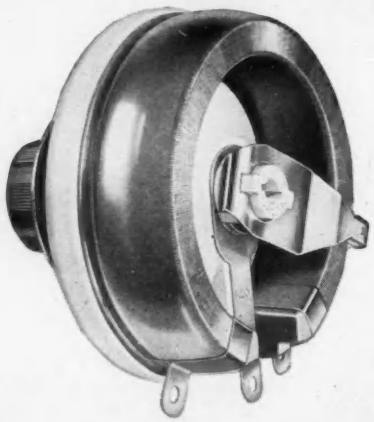
Control and research equipment for science and industry

relays, thermostats, time delays, energy regulators, D.C. amplifiers and potentiometric recorders

SC/68

Can you say Toroidally Wound Rheostats twelve times quickly?

It's a bit of a mouthful but you need only say it once — preceded by the name 'Cressall'. Whether you require the vitreous enamelled Cressall 'Torostat' (illustrated below) of extremely robust ceramic unit construction or the well-known open-wound type of rheostat or potentiometer, you will find none better than Cressall.



Forty years' experience in design and manufacture ensure that each Cressall product has extra quality inbuilt.

Write for Catalogue Section D, List 63.

Cressall

A.I.D. & A.E.B. APPROVED

THE CRESSALL MANUFACTURING COMPANY LIMITED

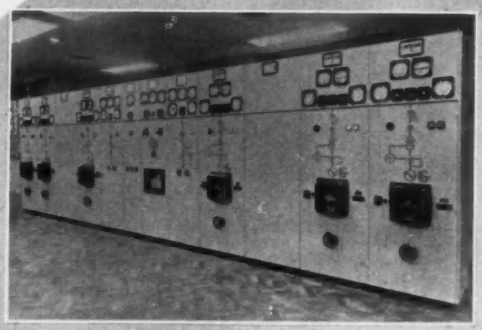
(A subsidiary of The Expanded Metal Co. Ltd.)

ECLIPSE WORKS · TOWER STREET · BIRMINGHAM 19 · TEL: ASTON CROSS 2666
LONDON OFFICE: BURWOOD HOUSE · CAXTON ST · S.W.1 · TEL: ABBEY 7766

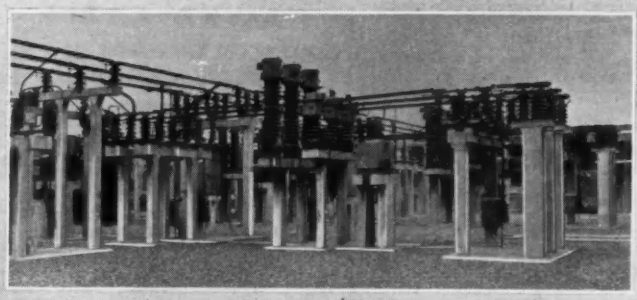
ROLLS-ROYCE LTD. DERBY. AERO ENGINE ALTITUDE TEST PLANT

WITH SWITCHGEAR SUPPLIED BY REYROLLE

The 33-kV 1000-MVA small-oil-volume switchgear and ancillary equipment controlling the supply to the six 22,000-H.P. compressor-motors was manufactured and installed by Reyrolle

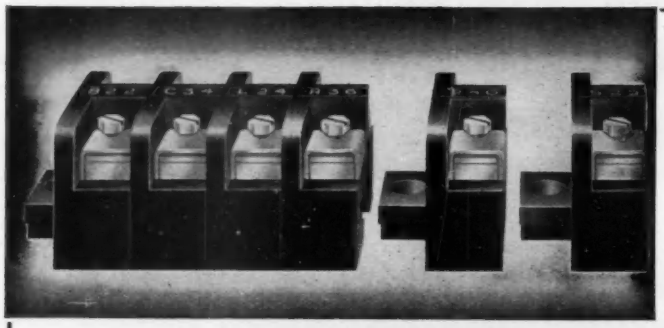


Photographs by courtesy of Rolls Royce Ltd.
Consulting Engineers: McLellan and Partners in association with Messrs. Merz and McLellan



Reyrolle

A. REYROLLE & CO. LTD. HEBBURN COUNTY DURHAM ENGLAND



Interlocking Terminal Blocks, 10–75 amp.

METWAY: MULTI-LOCKWAY

to B.S.S. & C.S.A. Specifications

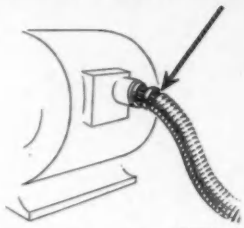
Our new Brochure contains particulars of hundreds of types of Terminal Blocks for every application. Every Engineer should ask for BROCHURE NBQ/10

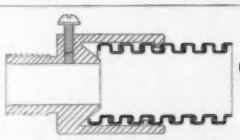
METWAY-BRIGHTON

PUT AN END TO THIS

with the

ABBOFLEX PATENT SELF-LOCKING ADAPTOR





The Internal Cone forces the successive convolutions of the flexible metallic conduit into close engagement and prevents the partial unclasping which is the cause of nearly all breakages. The conduit end becomes as strong as the rest of the conduit.

SPECIALLY DESIGNED TO SUIT ALL MAKES OF FLEXIBLE METALLIC CONDUIT, 'WATERTIGHT' and 'NON-WATERTIGHT'

The Abboflex Locking Adaptor, complete with EARTHING SCREW, is already available in the popular ¾" Male E.T. x ¾" Flex size.

Other sizes in production shortly.

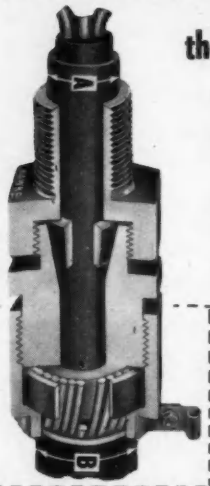
ABBOFLEX LIMITED

WALNUT TREE CLOSE, GUILDFORD, SURREY

Telephone : Guildford 5893

Makers of all types of Flexible Conduit, "ABCON" Adaptors, standard adaptors, etc.

SINCE ONLY THE BEST IS GOOD ENOUGH...



the 'HAWKE' range of cable glands now include a provisionally patented earth clip ensuring perfect safety

The new

Hawke

a masterpiece in GLAND design

Write for further details to

HAWKE CABLE GLANDS LTD

ASHWORTH ST., DENTON, MANCHESTER. Tel.: DENTON 3868-9 Telex 66-135

INSULATING SLEEVINGS

P.V.C. and POLYTHENE SLEEVINGS
INSULATED WIRES and FLEXIBLES

A.I.D. AND A.R.B. APPROVED

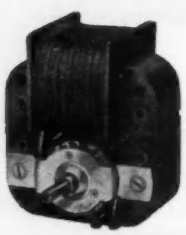
PLASTICABLE LIMITED

HAWLEY LANE - FARNBOROUGH - HANTS

PHONE: FARNBOROUGH, HANTS 85

ROLCO

SHADED POLE FRACTIONAL H.P. ELECTRIC MOTOR



Reliable, Silent and Versatile Power Unit for every kind of equipment.

Standard Types from 25va. to 80va. or to Customers' Specification.

Manufactured by

ROLCO ENGINEERING LTD.

407 Hornsey Road, London, N.19

Tel: ARC 6626

GEORGE ELLISON
LIMITED
PERRY BARR BIRMINGHAM 22B

announce that

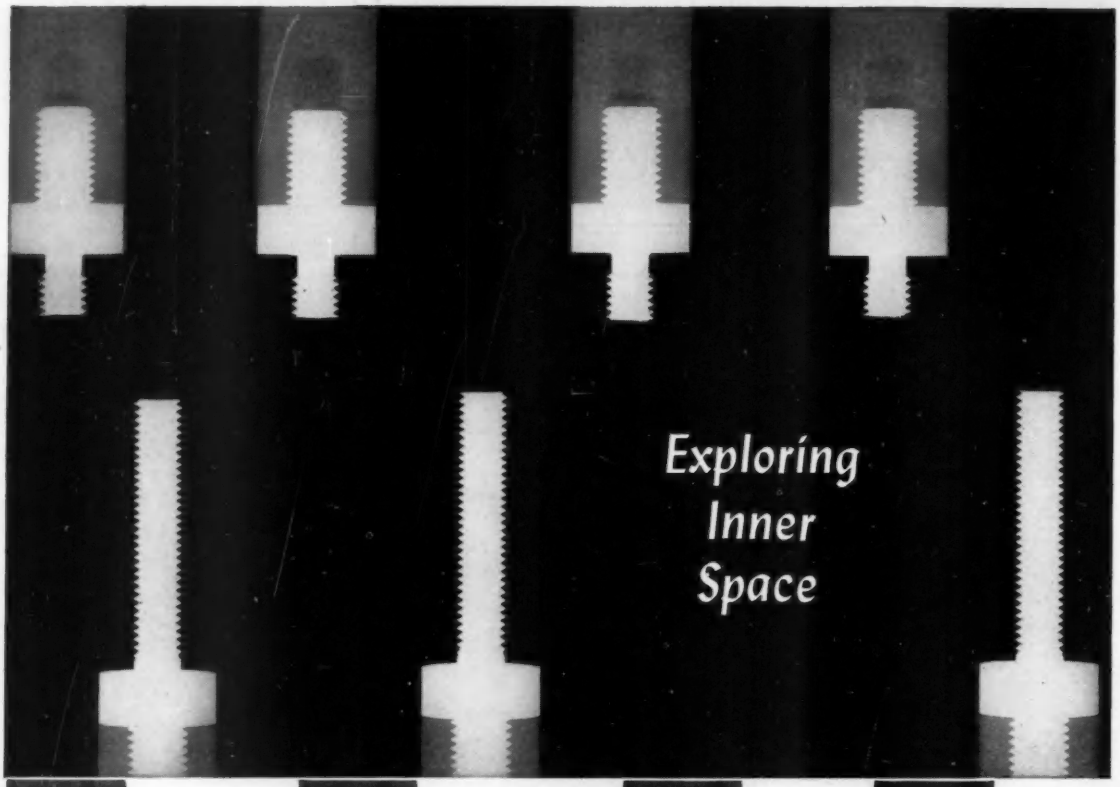
the following symbol and names

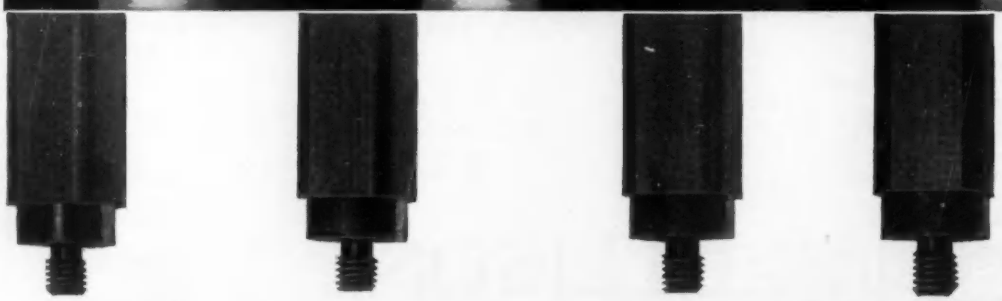
are their

Registered Trade Marks

ELLISON
BANTAM

800





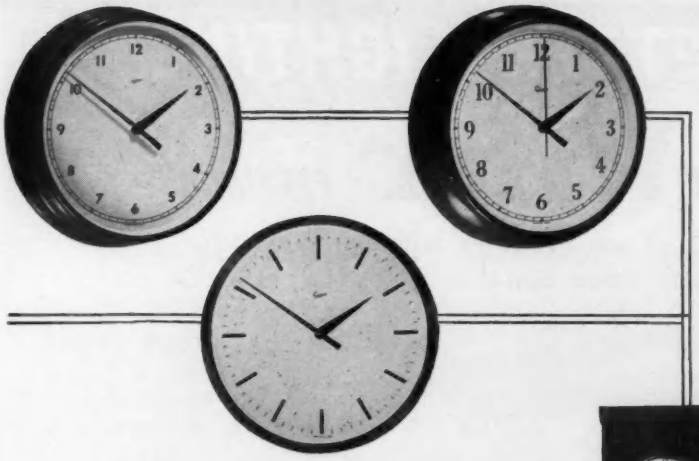
Permali lift-rods. Metal end-fittings screwed in. Mustn't pull out. Won't. *If* shear-strength of threading is greater than load on Permali rod. Threads are strong enough. Because they are long enough. But are they correctly engaged? Permali people make sure. X-ray them. Every single one of them.

(Photographs reproduced by courtesy of The British Thomson-Houston Co. Ltd.)

PERMALI

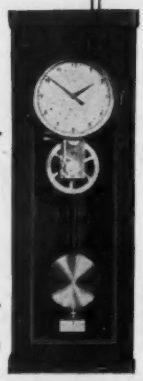
Totally tested...
...most reliable

PERMALI LIMITED GLOUCESTER · ENGLAND · TEL 24941



One hundred 'slave' clocks on a hundred walls—all keeping the same accurate time because they're controlled by the Gibson master clock. As integral a part of the building as the lighting system, Gibson clocks should be specified at the drawing board stage. Time recording, job costing and sound signal systems can be incorporated in these installations; which makes them essential for hospitals, schools, factories or wherever exact time-recording is necessary. Gibson clocks are immune to power failure as they are controlled by trickle-charged accumulators. Special designs can be carried out: available designs are varied and good.

Clock systems are obtainable on a rental basis or may be purchased outright.



The master clock masters time

Gibson CLOCKS are made by—

Time recording, job costing and sound signal systems can be incorporated in these installations

BAUME & CO. LTD

CLOCK DIVISION, 14a, ST. CROSS STREET
LONDON, E.C.1. CHAncery 6187

Geiger

BLANKET SWITCH

Three and Single Heat

Designed for perfect SAFETY

- ★ Contact chamber totally enclosed.
- ★ Switch lever in a separate compartment.
- ★ Special cover screws giving access to contacts for manufacturers only.
- ★ Two "OFF" positions.

ALL SWITCHES E.D.A. APPROVED

Sole Agents and Distributors:

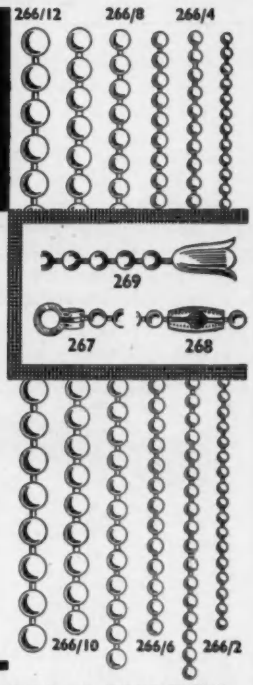
WALTER LOGAN & CO. LTD.

34 Oak Tree Drive
Totteridge, London, N.20

Telephone: Hillside 7319

Beacon

BALL CHAIN



SIX SIZES OF BALL CHAIN

FOR MANY PURPOSES IN THE ELECTRICAL INDUSTRY

"Beacon" 266 Ball Chain will not twist or knot, and by those very reasons lends itself to a multitude of uses. Available in SIX different gauges from 266/2 to 266/12, it is light, strong, decorative and essentially practical.

SMITH and DAVIS LIMITED.

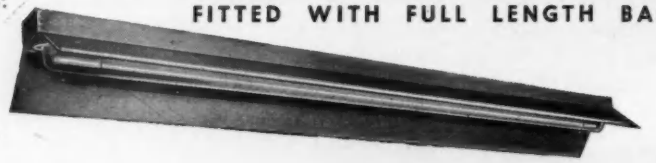
6, BEACON WORKS, FRIAR PARK RD., WEDNESBURY, STAFFS.
Tel: WEDNESBURY 0721-5. 'Grams: 'BEACONITE' WEDNESBURY.
LONDON OFFICE: 61/62, BROAD STREET AVE., BLOMFIELD ST., E.C.2.
Tel: LONDON WALL 2181

FOR BETTER LIGHTING

FLUORESCENT Wafax FITTINGS

Obtainable in 5, 4 and 2 ft. Single and Twin Models

FITTED WITH FULL LENGTH BACKPLATES

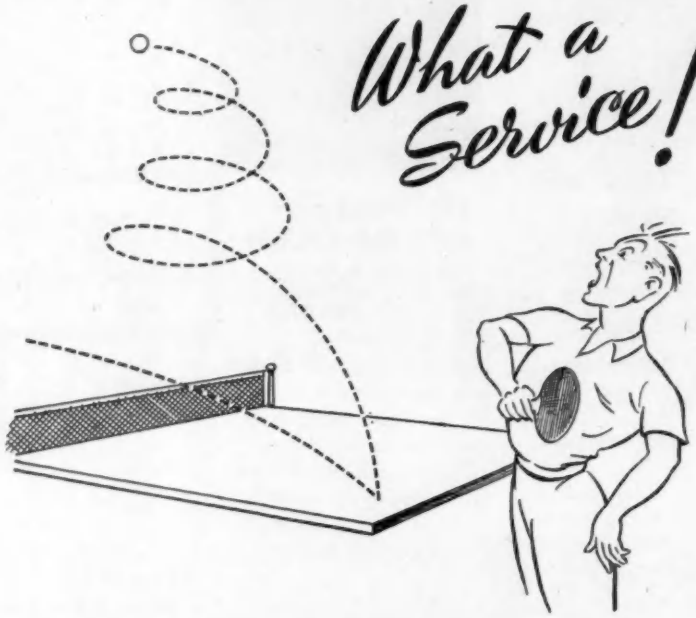


5' OPEN ENDED TROUGH
with Quick Release Covers.
£4.12.0d. List Price
excluding tube.

5' BATTEN
with Quick Release Covers.
£4.0.0d. List Price
excluding tube.

SEND FOR CATALOGUE

WADES (HALIFAX) LTD. *Arden Works, Fenton Road, Halifax* TEL. 61637



What a Service!

Purchase your

ELECTRICAL EQUIPMENT

CABLE, CONDUIT
CONDUIT FITTINGS
ACCESSORIES
SWITCHGEAR
SPECIAL CONTROL PANELS
ELECTRIC TOOLS
RADIO, TELEVISION
HEATING APPLIANCES
INDUSTRIAL
COMMERCIAL
AND DOMESTIC
LIGHTING
EQUIPMENT

from the Wholesalers who have it in stock

Jamaica Row, Birmingham 5
Phone : MIDland 6714 (6 lines)
and at
Ford Street, Coventry
Phone 40501 and 2

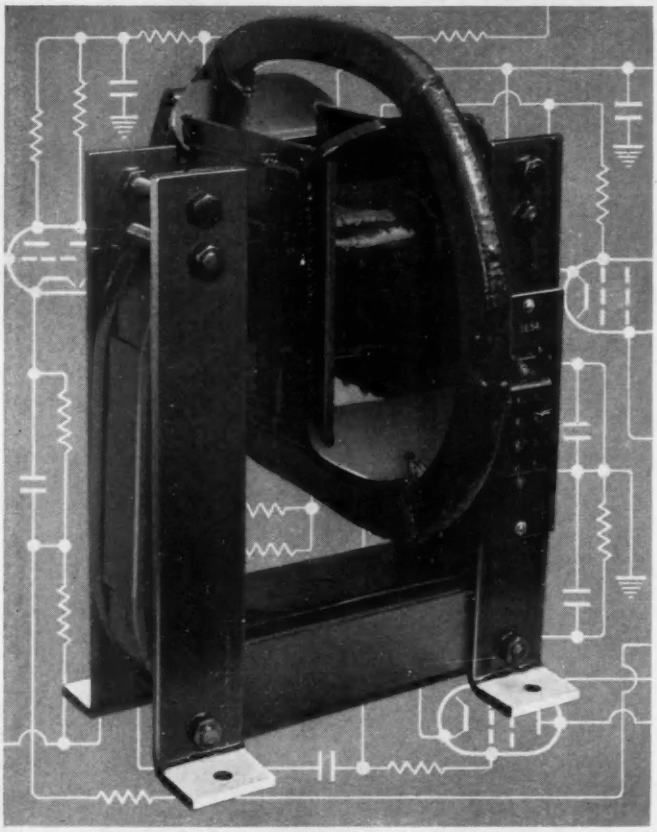
RICH & PATTISON (B'ham) LTD.

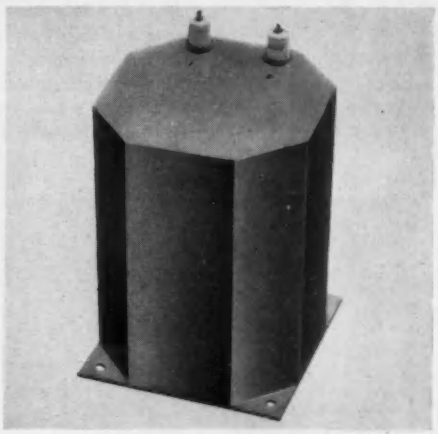
Electrical Wholesalers and Manufacturing Engineers

Special or Standard

Technical advances in electrical and electronic engineering often call for the development of special transformers. Savage of Devizes thrive on breaking this new ground, and many of their revolutionary Massicore instruments of a few years ago are now regarded as "standard" products.

Special or standard, *all* Massicore transformers have the same essential ingredient—conscientious craftsmanship. Equally important is the individual attention given to all enquiries and orders regardless of size; and we make a point of keeping our delivery promises.





The special Massicore transformer on the left (type 5E54) has the following characteristics: Primary 115v and 230v. Secondary 230v 500VA. Total capacity secondary to core and primary 15 p.f. Total leakage inductance 25 m/hys. Full load regulation 7%.

The more standard instrument illustrated above is an hermetically sealed smoothing choke. Your requirements may call for instruments very different from these examples. Please take advantage of our experience, knowledge and constructional skill in the production of all types of transformers.

Corner for Contented Customers

"I would like to offer my utmost thanks to you for helping us with our problems. I am certain that your services could not have been equalled by another firm".

L.M.C., POOLE.

MASSICORE SAVAGE

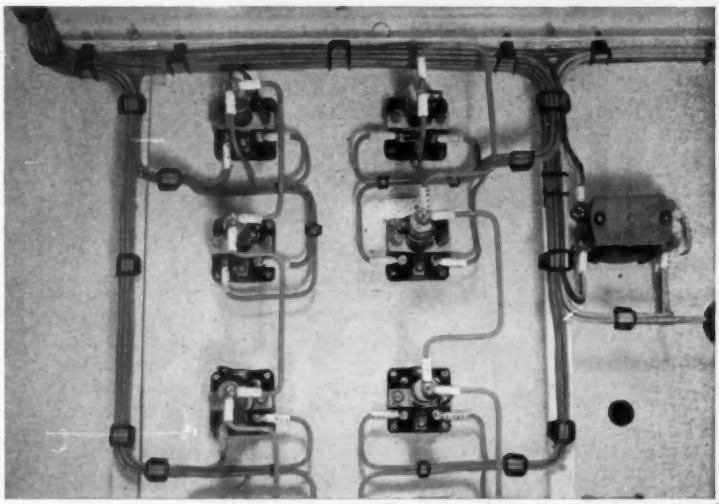
SAVAGE TRANSFORMERS LTD · Nursteed Road · Devizes · Wiltshire · Tel: Devizes 932

TF/58

EVANS THE ESTIMATOR *says . . .*

"costing's a lot easier these days ..... thanks to Cradleclip!"

"When you know for sure the cost of your wiring components and when you know that you can depend on a 50% plus saving in time and cost against any other wiring system, you know that you have a cost contingency on many other aspects of switchgear costing and production! That's only one reason why we know Cradleclip is a must for us!" When you add to Mr. Evans' point the many other outstanding features of Cradleclip's one . . . two . . . and it's done! slickness you can see how Cradleclip's remarkable versatility produces greatly beneficial advantages in every stage of switchgear production and wiring contracts.

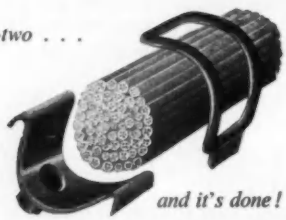


Section of Cubicle Control Board, showing CRADLECLIP.

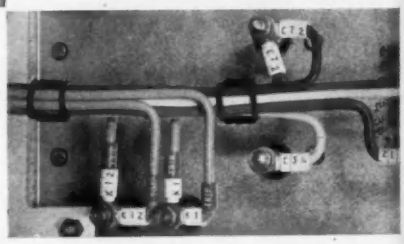
JUST LOOK AT THESE CRADLECLIP FEATURES—

- Cuts wiring time by 50%.
- Combines high speed fixing with simplicity and complete security.
- Brings a new versatility, compactness and neatness to your wiring.
- Completely insulated and suitable for all climates.
- Electrical and mechanical security in all conditions.
- Proved in wiring installations throughout the world.

one-two . . .



and it's done!



Close-up of CRADLECLIP installation.

Photographs by kind permission of South Wales Switchgear Ltd., Blackwood, Monmouthshire.

Proof of facts about how you can save money on wiring with CRADLECLIP is contained in our Time and Motion Study Report which is available now at your request.

Send for fully descriptive literature on the Insuloid Cradleclip Wiring System now and find out about these other Insuloid products for greater cable fixing security and efficiency—

SAS and AS Adjustable Saddles
NX, X and CY Cable Clips
Ring Lock Bushes
Busbar Insulation with P.V.C. Sleeving
Flexiguard Cubicle-to-Door Cable Trunking

Insuloid cradleclip

Twice as good . . . twice as quick . . . when you wire with CRADLECLIP

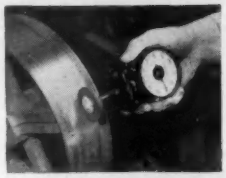
INSULOID MANUFACTURING COMPANY LIMITED

Sharston Works Leastone Ave. Wythenshawe Manchester

Tel: Wythenshawe 2842 & 3163

indicating r.p.m. of electric motor.

Indicating shaft speed, showing use of extension.

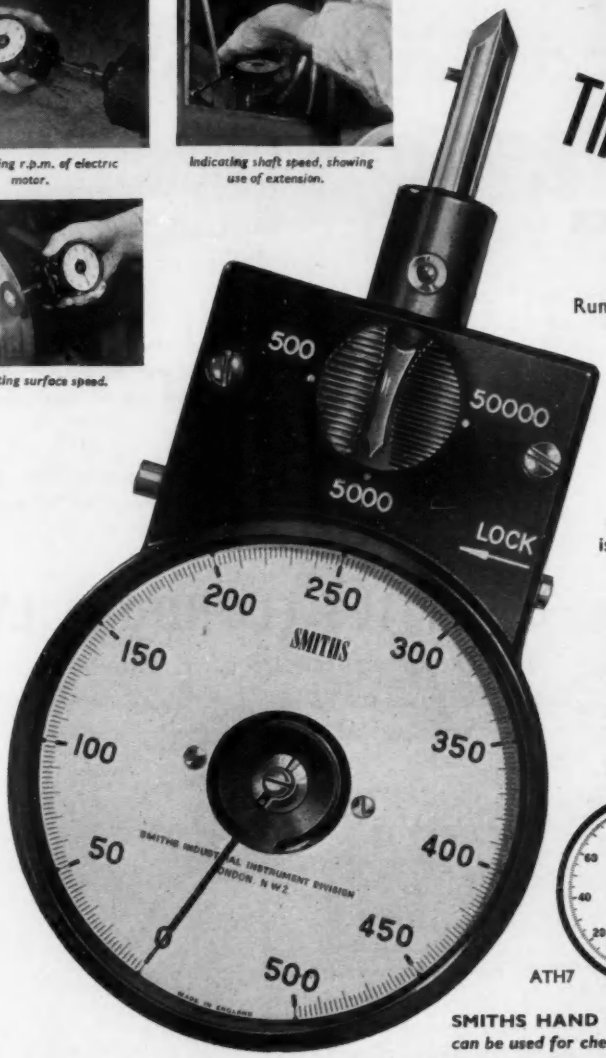


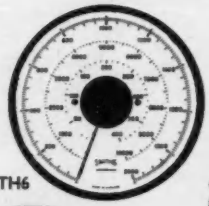
Indicating surface speed.

The Right REVS

Run your machinery at the optimum speed for peak efficiency. Any deviation from this speed almost certainly means that it—and you!—are running at a loss.

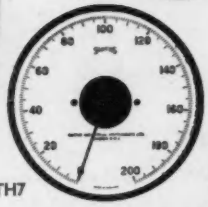
Cut this loss by making spot checks of r.p.m. with a SMITHS Hand Tachometer. Such a check can be made in an instant, even in unfavourable conditions. What's more, the reading is accurate to within ½%.





ATH6

PRICE
(complete with strong case and full range of accessories)
£14.14.0
postage and packing extra.



ATH7

ATH10

SMITHS HAND TACHOMETERS
can be used for checking:—

Rotational speeds of shafts, spindles, gears, rotors and rolls.

Linear speeds in ft/min or metres/min of metal strips, textiles, paper, wire, plastic, film and conveyed material.

Surface speeds in ft/min or metres/min of cutting or grinding operations of machine tools, processing rolls, unwind rolls or wind up rolls for extrusion and strip production.

Readings can be taken in bad lighting conditions or where the dial is visually obscured.

AVAILABLE IN CHOICE OF FOUR MODELS:—

Model A.T.H. 4	**illustrated**	**(0-50,000 r.p.m.)**
Model A.T.H. 6	**dial illustrated**	**(0-10,000 r.p.m.)**
Model A.T.H. 7	**dial illustrated**	**(0-20,000 r.p.m.)**
Model A.T.H. 10	**dial illustrated**	**(0-5,000 r.p.m.)**

ALL FOR L.H. OR R.H. DIRECTIONS OF ROTATION

POST THIS FOR FULL DETAILS

Please send full details of your HAND TACHOMETERS

NAME _____

ADDRESS _____

_____

_____

SMITHS INDUSTRIAL INSTRUMENT DIVISION

Chronos Works, North Circular Rd., London, N.W.2. Tel: GLAdstone 1136

UTILAIR

REGD. TRADE MARK

22 years of progress

TODAY, after 22 years of Progress, Research and development, expansion has demanded the opening of our new factory at Morden Road, Mitcham, Surrey. Greater manufacturing and storage space will mean that a more comprehensive range of Fluorescent Lighting Fittings and Equipment will be maintained, whilst speedier delivery of urgent requests can be effected.

In specifying UTILAIR Authentic Lighting Equipment for any contract, you can be assured that the installation will stand the test of trouble-free operation under all conditions.

We shall be pleased to advise and assist with any special requirements and the services of our Technical Dept. are at all times at your disposal.

HEAD OFFICE
TUNSTALL ROAD
BRIXTON · LONDON · SW9

UTILITIES (LONDON) LTD.

Manufacturing Electrical Engineers

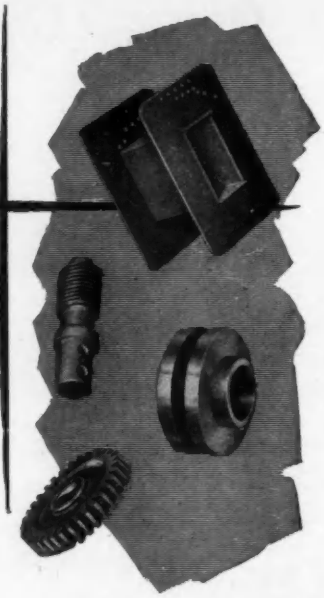
Telephone: BRIxton 6811-2-3 Telegrams: UTILON, LONDON, S.W.9

PIRTOID

SYNTHETIC RESIN BONDED LAMINATE

brings you
MATERIAL SOLUTIONS
to your
CURRENT PROBLEMS

. . . because the range of PIRTOID Paper and Fabric base laminates affords all the machining qualities needed with consistent uniform dielectric and mechanical strength. Read this booklet, sent gladly on request.



H. CLARKE & CO. (MANCHESTER) LTD

Atlas Works · Patricroft · Manchester

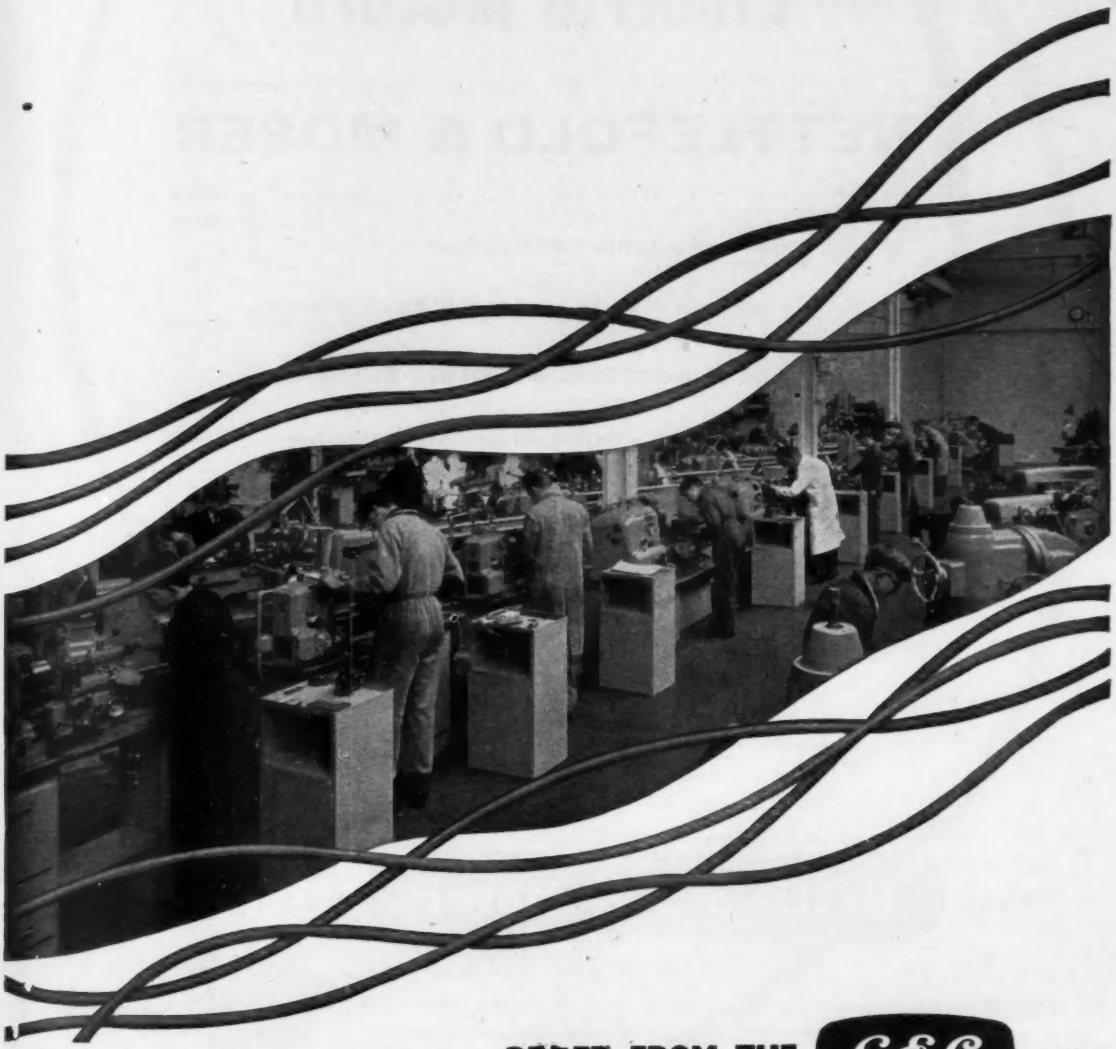
Telephone Nos. ECCLES 5301-2-3-4-5

dmCK.4

PIRELLI GENERAL

CABLES

More than equal to the extra service demanded



ORDER FROM THE G.E.C.

The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2

Electric Motors

NETTLEFOLD & MOSER

have available from stock:—

"BROOK" & "NEWMAN" FRACTIONAL

and INDUSTRIAL ELECTRIC MOTORS

and are the *Sole London Stockists* for

"G.E.C." INDUSTRIAL

ELECTRIC MOTORS

When the call is for Electric Motors . . .

ring **Nettlefold & Moser** *first*

NETTLEFOLD & MOSER LIMITED
LONDON: Box 378, 170-194 Borough High St., S.E.1.
Phone: HOP 7111 (40 lines).
BOOTLE: Dunnings Bridge Road, Bootle 10, Lancs.
Phone: Aintree 4171 (6 lines).
HULL: 201 Sculcoates Lane, Hull
Phone: Central 41341 (3 lines)

FRIDAY
3 OCTOBER
1958

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

In This Issue

Electricity Supply Report 597
Published this week, the 1957-58 report on the electricity supply industry in England and Wales incorporates the tenth and final report of the former Central Electricity Authority. The last three months of the financial year, to 31st March, is covered by the Electricity Council and the Central Electricity Generating Board

Ferrybridge "B" Power Station 603
This station, in South Yorkshire, operates on the reheat cycle, the steam conditions at the turbine stop valve being 1,500 p.s.i. and 975 deg F, with reheat to 955 deg F at 432 p.s.i.

Building Construction and Space Heating 611
The relative thermal insulation merits, and costs, of the more common types of construction available for buildings with electric space heating are discussed and the meaning of "U" as a factor of thermal efficiency is explained

Nickel Alloy Production 621
Description of the plant at the Hereford works of Henry Wiggin & Co., Ltd., for the production of "Nimonic" and other alloys of nickel — the first part of a three-stage extension

South Denes Power Station 627
Residual oil is used as fuel in the South Denes station, Great Yarmouth, which was officially inaugurated last Friday. Two 60 MW sets are at present in service and two more are planned for commissioning in May, 1959, and January, 1960

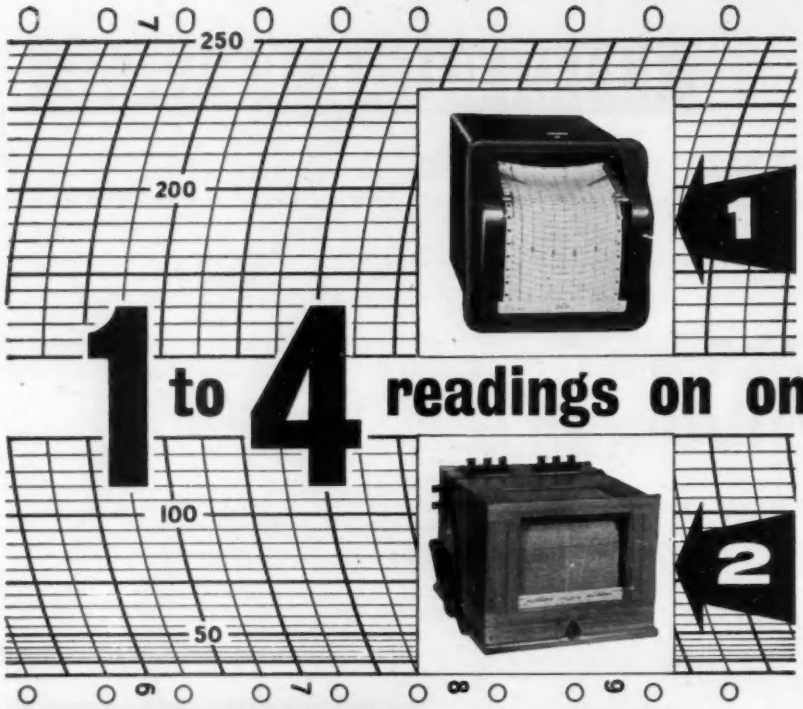
Domestic Electrical Equipment — Food Mixers 630
Besides their primary use, food mixers can be adapted for a variety of tasks such as shredding, potato peeling, bean slicing, etc. Details are given of the various models available and the prices of the mixers and attachments

✧ ✧ ✧ ✧

Views on the News 615
Moriston Scheme 616
B.S.I. Annual Report 616
Personal and Social 617
Submarine Telephone Cable 620
Letters to the Editor 620
Industrial News 623
Generation and Development 628
New Electrical Equipment 629
Financial Section 632
Next Week's Events 637
Contract Information 638
REGIONAL GUIDE TO ELECTRICAL CONTRACTORS 105
CLASSIFIED ADVERTISEMENTS 109
INDEX TO ADVERTISERS 120

VOLUME 163 NUMBER 14 ✧ *Eighty-Sixth Year of Publication* ✧ FRIDAY PRICE 1s 6d

Editorial, Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1. Telegraphic Address: "Electrev, Sedist, London." Code: ABC. Telephone No. Waterloo 3333 (60 lines). Registered at the General Post Office as a Newspaper. Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home £4 15s 0d; Overseas £5 15s 0d; U.S.A. and Canada $16.00. Cheques and Postal Orders (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD. and crossed "Lloyds Bank."



1 to 4 readings on one recorder

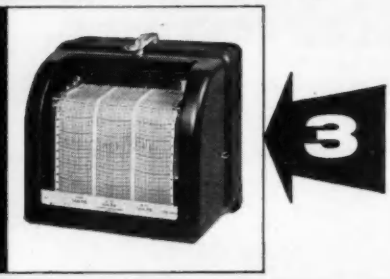
Single
One record on a 4 in. chart

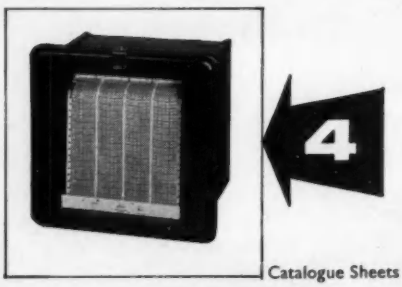
Duplex
Two records on 4 in. or 1⅞ in. charts

Triplex
Three records on 2¾ in. charts

Quadruplex
Four records on 1⅞ in. charts

"Inkwell" GRAPHIC INSTRUMENTS





'Inkwell' Graphers in flush, semi-flush or projecting switchboard cases and in portable types for laboratory or test room use, are available for recording all normal electrical phenomena and some abnormal conditions such as short-time transients and earth fault current, plus measurements of speed, operating times, etc. Mixed records can be provided in multi-record instruments, e.g. amps and volts in Duplex, amps, volts and speed in Triplex, and as all charts are driven in synchronism, each record is accurately related to time.

Catalogue Sheets 300A, 302A and 303A sent on request

EVERETT EDGCUMBE & CO. LTD.

COLINDALE WORKS, LONDON, N.W.9 *Telephone: COLINDALE 6045*

London Office: COLUMBIA HOUSE, ALDWYCH, W.C.2 *Telephone: CHAncery 5953/4*

and at: BIRMINGHAM · CARDIFF · GLASGOW · MANCHESTER · SHEFFIELD

DHB/6057

ELECTRICAL REVIEW

3 October 1958 Vol. 163 No. 14 Established 1872

Electricity Supply Progress

OVER the three years 1954–57 the annual percentage increase in sales to electricity consumers showed a decline, but in the year ended 31st March last this tendency was arrested and the rate of expansion was nearer to what we have come to regard as "normal." This was the result of substantial improvements in the sale of both industrial and domestic electricity. Industrial supplies, which account for about half of the total, went up by 7·9 per cent and domestic sales (representing about a third) by 7·3 per cent.

This is one of the leading features of the last report prepared by the Central Electricity Authority (in conjunction with the Electricity Council and the Central Electricity Generating Board) which is dealt with in this issue. The industry was also successful financially (which is not common in nationalised concerns), although its surplus of £16 million on a "turnover" of £474 million was not excessive.

It is noteworthy that between them the Area Boards earned a trading surplus of under £3 million (and well over half of this came from contracting and the sale of "fittings"). This is a reflection of the narrow margins on which they have been working as a result of past restrictions on prices. During 1957–58 all of them raised their charges and the full effects will be felt in the current year, unless they are overtaken by rising costs.

Generating plant is now adequate to meet immediate needs, after a long period of strain. Last year about 1,700 MW net was added to maximum output capacity, raising the total to over 22,000 MW; the maximum demand was 19,311 MW. While great care must still be taken to guard against a recurrence of plant shortage, it looks as though more attention might now be paid to distribution systems when the allocation of capital is under consideration.

From a wealth of interesting subjects embodied in this voluminous report it is difficult to choose points for special mention. One matter may be mentioned to show how rapidly ideas can alter and how difficult it is for the industry to keep up with them. Comparatively recently there was a scare about the approaching scarcity of coal supplies. The Central Electricity Authority was induced to adopt oil firing for some of its stations and the atomic energy programme was speeded up. Now there seems to be no danger of a lack of coal for a much longer period, but there are doubts about oil supplies. In the meantime the nuclear power programme is going ahead and the Authority is able to say that the long-term fuel prospect can be viewed with greater assurance than was possible a few years ago.

In spite of vicissitudes and doubts, however, the electricity supply industry is going ahead and all those connected with it can be confident of its future.

ADEQUATE WIRING CAMPAIGN

Correspondence which we have published on the deterrent effects of inadequate wiring on the use of electricity in the home is evidence of the wide interest in this problem and of the growing concern that something should be done to promote better standards. It also illustrates the danger, apparently inseparable from discussions on wiring, that the general aim may be obscured by detailed arguments on the relative merits of different systems and types of accessories.

There is a clear need to persuade architects, builders and householders of the desirability of installing an adequate number of socket outlets in new premises and of providing existing householders with suitable information on the ways in which they can improve their present inadequate installations. The campaigns of the various organisations promoting better wiring in the United States have been most successful and the excellent literature they have produced might well form a model for a similar co-operative effort in this country.

FUTURE OF NICKEL

Nickel, in common with other industrial metals, has been subjected to disturbing influences during the past two or three years. Before then the demand for the metal, largely for "defence" purposes, outran the supply. Nevertheless progress was made in its applications in the form of a wide and varied range of alloys. Now the metal is more freely available. Concurrently with the expansion of Canadian production there has been a fall in demand; the United States has slowed up its "stock piling" and has experienced a recession.

Productive capacity in the "free world" this year is estimated at 525 million pounds while consumption is put at between 325 and 345 million pounds, considerably below the 1957 figure. Nevertheless the largest producers in this country of nickel alloys, Henry Wiggin & Co., Ltd., are so confident of the future of the metal that they are carrying out a big programme of extensions at their Hereford works, the completion of the first stage of which is reported on page 621.

The company bases its faith on the facts that the shortage of nickel in past years has led to the adoption of less satisfactory substitutes and that nickel alloys are the best means of meeting the requirements raised by the ever higher temperatures at which machines operate.

BUILDING FOR SPACE HEATING

We think that Mr. Ellarby in his article in this issue on building construction (p. 611) has rendered valuable service to the industry by drawing attention to the necessity for special measures where continuous all-electric space heating is to be employed. It is sad to have to admit that by far the greater amount of electric space heating employed in this country, if not in all countries, is used only intermittently. There is a tremendous difference between continuous and occasional heating and the longer we go on using intermittent space heating the more we spoil the chances of continuous heating.

Obviously, from all points of view, continuous heating is the method of real value to the electrical industry. Therefore the sooner we come to accept the necessity of constructing buildings so that continuous heating can take its proper place, the sooner shall we establish electric heating on a sound and economic basis.

ITALIAN REACTOR CONTRACT

In commenting last week upon the negotiations for the placing of a nuclear power station contract by the Italian National Electro-Nuclear Co. we were overtaken by events; on the same day the award of the contract to the International General Electric Co. was announced. High hopes were entertained by the British consortia who tendered for the work and the result is therefore a severe disappointment. It is some consolation that one British group has already secured the contract for the first Italian nuclear station but to keep their elaborate organisations in being and occupied the British consortia must look beyond this country for orders. The placing of the order for the second Italian station with an American concern is thought likely to influence other prospective customers.

It is not certain whether the decision was made on technical, economic or financial grounds. If the first two reasons were the main consideration the British constructors will no doubt adjust their designs to meet the requirements. But if it was mainly a matter of finance there would seem to be a case for Governmental action.

SIXTH C.E.G.B. NUCLEAR STATION

Application has been made by the Central Electricity Generating Board for consent to the development of a site in East Suffolk for its sixth nuclear power station. Already substantial progress is being made with the first three—those at Berkeley, Gloucestershire (275 MW), Bradwell, Essex (300 MW) and Hinkley Point, Somerset (500 MW). Site work has started at Trawsfynnyd, North Wales (400-500 MW) and application has been made for permission to erect a station at Dungeness, Kent (500 to 550 MW). The proposed Sizewell station is planned to have an initial output of about 650 MW but there will be room for further development. It should also be mentioned that work is going ahead on the Hunterston, Ayrshire, station (320 MW) of the South of Scotland Electricity Board.

POWER STATION DESIGN

The 300 MW Ferrybridge "B" generating station which is being constructed near Pontefract in South Yorkshire is interesting for a number of reasons. The building volume is 31 cu ft/kW and the station has cost about £49/kW to build. One of the ways in which these figures have been achieved is by arranging unloading bays with railway tracks between Nos. 1 and 2 and Nos. 2 and 3 machines. This has permitted a reduction in height of the turbine house, the crane and, consequently, a simplification of the foundations. Due to the fact that the three 100 MW machines operate on the reheat cycle the control gear is a little unusual. For instance, interceptor valves have been included to prevent the flow of steam into the i.p. cylinder and as a further protection unloading valves are provided on the pipework to and from the reheater.

Electricity Supply in 1957-58

REPORT COVERING TRANSITION PERIOD

Trading revenue of the C.E.A. and C.E.G.B. for the year ended 31st March last amounted to £340 million against £298 million in 1956–7 and there was a surplus on the year of £16 million, including £3 million from the Area Boards. Total sales to consumers rose by 7.6 per cent to 72,661 million kWh

AT the end of 1957 the Central Electricity Authority was dissolved and the Central Electricity Generating Board and the Electricity Council took over. This week the final report of the C.E.A. was published. Although this covers only the nine months ended 31st December last, in order to preserve statistical continuity and to facilitate comparison with previous financial years corresponding particulars and full accounts for the year ended 31st March, 1958, have been added. The same considerations apply in the case of the twelve Area Boards.

The opportunity is taken in this final report* to review progress made since the electricity supply industry was nationalised at 1st April, 1948. In the 9¾ years up to 31st December last the installed capacity of generating plant rose by 107 per cent to 24,235 MW and the output capacity by 115 per cent to 22,240 MW, although the number of stations was reduced from 291 to 262. The power stations with an output capacity of 150 MW or more increased from 21 to 64, while the unit capital cost of conventional stations commissioned in 1948 and those under construction in 1957 was the same, viz. £50/kW. Electricity sent out annually rose by 115 per cent between 1948 and 1957; coal expended per kWh declined by 15 per cent and efficiency improved by over a fifth. There was an increase of over 60 per cent in the route-mileage of grid lines (66-275 kV) and one of 95 per cent in circuit mileage. Main transformer capacity went up by 188 per cent, the number of grid substations by 60 per cent and the maximum demand by 112 per cent.

The Area Boards' h.v. mains increased in circuit mileage by 59 per cent, their l.v. systems by 31 per cent, the number of transformers by 117 per cent and their capacity by 102 per cent.

Other increases were:—Number of consumers 37 per cent; annual sales to consumers 116 per cent (industrial 124 per cent, domestic 88 per cent); average consumption per domestic consumer 37 per cent and per head of population 99 per cent; annual sales of electricity to farms 433 per cent. The average price per kWh rose by only 34 per cent against increases of 60 per cent in the retail price index, 71 per cent in the delivered price of power station coal and even greater increases in other costs.

The number of employees rose from 147,200 in 1948-49 to 185,209 at 31st December last, but in the same period there was a reduction of 37 per cent in the number of employees per million kWh sold to consumers.

Reverting to the 1957-58 report, particulars given in Table 1 show the kWh output of all public generating stations to have been 8·9 per cent more than in the previous year. All but 0·3 per cent of the total was produced by steam stations, statistics for which are presented in Table 2. The improvement in thermal efficiency to 25·51 per cent was equivalent to a saving of more than 1,062,000 tons of coal valued at £4·3 million, bringing the total amount of fuel saved since 1947-48 to 41·4 million tons worth £147 million. The twenty most efficient stations, thermally, which contributed about 28 per cent to the national output, achieved an overall average of 29·66 per cent, eight of them, led by Castle Donington (32·16 per cent), returning upwards of 30 per cent. Of the coal burned, 0·2 million tons was imported and 5·2 million tons was open-cast. Transport was 22·2 million tons by rail, 26·3 million by sea and 19·1 million by road.

New plant brought into commission had an aggregate capacity of 1,700 MW distributed among 24 power stations, including four new ones. Of the total generating plant in operation, 18·5 per cent of the turbo-alternator capacity and 15·8 per cent of the boiler capacity was more than 25 years old. An average loss of 10·2 per cent maximum output capacity was suffered last December and January (compared with 10·5 per cent in the previous year); this was attributed to breakdowns 5·3; overhaul 2·4; and miscellaneous 2·5 per cent. The maximum demand

TABLE 1. GENERATION AT ALL PUBLIC STATIONS

	1956-57	1957-58
Power stations in operation, number	262	253
Installed capacity, MW	22,572	24,315
Maximum output capacity, MW (a)	20,644	22,343
Electricity generated, million kWh	79,525	86,613
New power stations commissioned	3	4
Capacity of new plant in 24 power stations, MW	1,928	1,700
Plant shut down, MW	103	111

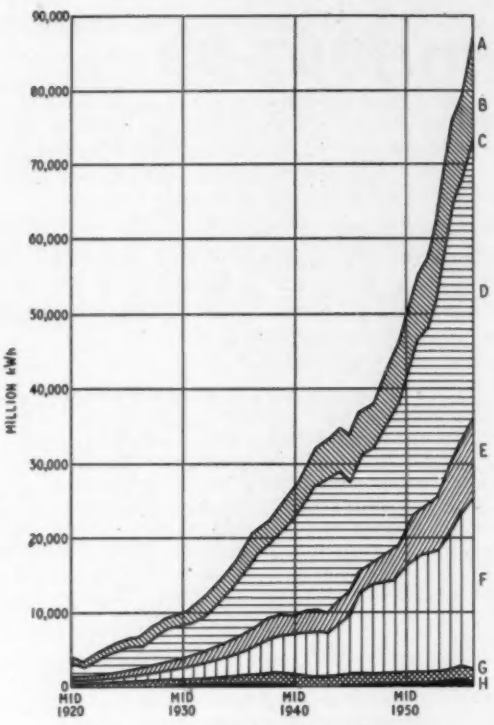
(a) Installed capacity less that required for station auxiliaries and on account of technical limitations.

TABLE 2. GENERATION AT STEAM STATIONS ONLY

Technical Details	1956-57	1957-58
Power stations in operation, number	225	218
Maximum output capacity, MW sent out	20,481	22,184
Electricity generated, million kWh	79,299	86,358
Electricity sent out, million kWh	74,378	81,053
Fuel burned, all types, million tons	42·54	45·37
Coal	41·44	43·66
Oil	0·27	0·90
Other types	0·83	0·83
Fuel, total, lb/kWh sent out	1·28	1·25
Coal, average calorific value, B.Th.U./lb	10,646	10,523
Coal, per cent pulverised	58·0	63·9
Heat rate, B.Th.U./kWh sent out	13,688	13,355
Thermal efficiency per cent	24·93	25·51
Coal price (excl. handling) d/ton	936·4	957·8
Fuel handling d/ton*	45·7	45·2
Employees, number per MW of output capacity	1·86	1·73
Works Costs, pence/kW		
Fuel, including transport	0·5370	0·5545
Fuel handling*	0·0261	0·0253
Operation salaries and wages	0·0402	0·0402
Oil, water and stores	0·0039	0·0039
Repairs and maintenance	0·0421	0·0422
Total works costs	0·6493	0·6661

* Includes pulverising, ash handling and disposal and flue gas treatment.

*H.M. Stationery Office, price 14s.



Growth of public supply in England and Wales

(A) Electricity generated. (B) Used in power stations and in transmission and distribution. (C) Total kWh sold to consumers. (D) To industry. (E) To commercial premises. (F) Domestic consumers and farms. (G) Traction. (H) Public lighting

(16th December) of 19,311 MW was 1,643 MW higher than in the previous year. The load factor over the year was 48 per cent.

During the next six calendar years 11,900 MW of new plant (including 1,575 MW in nuclear stations) is scheduled for operation. In the meantime 2,100 MW of obsolete plant is to be closed down, apart from that discarded in 1957-58, giving a net addition of 9,800 MW. Included in this programme are coal-fired units of 550 MW (Thorpe power station) and 275 MW (Blyth "B"). Generators of 200 MW, using water for direct cooling of stator conductors, are proposed for two new stations (following satisfactory service with a prototype 30 MW set); a similar 60 MW set has now been brought into operation.

A record in speed of construction was set up when the first 60 MW unit at Rogerstone power station (Newport, Mon) was started up exactly three years after work was begun on the site, a second set being commissioned three months later. Plant now on order will require only 28 cu ft per kW of building space compared with about 50 cu ft in 1948; this, coupled with larger units and other technical advances, is expected to result in an overall cost per kW no higher than ten years ago, although the cost of labour and materials has increased by at least 70 per cent.

For a new type of cooling system, using jet condensers under trial, the circulating water will pass through a closed circuit incorporating heat exchangers round the base of a "dry" cooling tower. Its probable higher cost might be partly offset by saving in fuel transport costs through siting stations closer to collieries in water-scarce areas. Increasing use is being made of electronic digital computers to determine the best distribution of coal between collieries and power stations.

The Grid System

The present position in regard to the main transmission system is shown in Table 3. A further 21 new points of supply to the Area Boards were settled, making a total of 167 in England and Wales during the past ten years. As compared with the cost which would have been incurred if requirements had been met by developing existing points of supply the total capital savings are estimated at over £15 million.

Two new designs of air-blast switchgear were approved for ratings of 3,500 MVA at 132 kV and 7,500 MVA at 275 kV. Half of the 132 kV breakers installed at vesting day have been modernised, but this course is no longer suitable for most substations, from which breakers are being transferred to lesser duties.

Automatic high-speed three-phase reclosing equipment is being tried on four 275 kV overhead lines, reclosure taking place after tripping on transient faults in approximately 0·35 sec; if the fault remains the breaker trips out again and is locked out. In a number of unattended 132 kV substations, lines or transformers are automatically restored to service provided the lines supplying the substations are first reclosed from an attended point.

A new standard rating of 180 MVA for 275/132 kV auto-transformers will have cores of cold-reduced grain-oriented steel with a flux density of 15,000 lines/sq cm. This type of steel is being ordered for 132 kV transmission transformers also.

A contract was placed for 275 kV single-core oil-filled cables for four generator-transformer circuits with route lengths of 300 and 600 yd. A new design of 25 kV oil-filled cable, having two conductors disposed concentrically, has been adopted for main line railway electrification to connect public supply and track feeder substations.

A unit protective system employing a radio link between two sections of a line and a single-wire signal circuit to be supported on the towers of a 132 kV line are planned. There were 578 primary faults on the system during 1957-58, 92·9 per cent being correctly cleared compared with 477 in 1956-57 with 89·3 per cent correct clearances. New schemes for distance protection and directional over-current protection have been developed which, in certain circumstances, enable overlapping to be avoided; these operate over the grid indication network and use only simple voice-frequency signals.

Six new research projects were initiated during the year, the most important of which relate to steam generation at high temperatures and pressures, boiler corrosion and high-voltage d.c. transmission.

Analysis of Sales

Sales to consumers during the year ended 21st March last totalled 72.661 million kWh which represented an increase of 7·6 per cent over 1956-57 and about four times

TABLE 3. MAIN TRANSMISSION SYSTEM

In commission at 31st March	1957	1958
Overhead lines, route miles (total)	5,051	5,532
275 kV	557	621
132 kV	4,403	4,818
66 kV and below	91	93
Underground cables, route miles (total)	449	446
275 kV	—	—
132 kV	90	101
66 kV and below	359	345
Substations, number	362	386
Transformer capacity, MVA (total)	28,690	32,598
275 kV	2,880	4,200
132 kV	23,447	26,074
66 kV and below	2,353	2,323

the pre-war figure. Details are given in Tables 4 and 5 of the sales to the various classes; it will be seen that the greatest proportional rise was again in farm supplies. Last year the rate of industrial expansion was greater than that of domestic consumption; this was the reverse of 1956-57 experience. The growth in the number of consumers slackened off during the year, being 2·4 per cent against 2·8 per cent in 1956-57, but this tendency is a natural one as the number of premises still to be connected is reduced.

Sales for railway traction rose by 5·9 per cent, but as

TABLE 4. CONSUMERS AND SALES

Class	No. of Consumers 31.3.58	Per cent inc. or dec. on 1956-57	Sales of Electricity 1957-58 Million kWh	Per cent inc. or dec. on 1956-57
Domestic	13,093,405	+2·5	22,108	+7.3
Farm	200,689	+6·6	1,279	+9·7
Commercial ...	1,183,257	+1 9	9,060	+7·8
Combined domestic and commercial	228,192	—0·2	1,032	+8·6
Industrial	175,259	+0·8	37,000	+7·9
Public Lighting ...	4,370	+2·2	630	+7·1
Traction—				
Railway ...	55	—3·5	1,230	+5·9
Street			322	—6·4
All classes... ...	14,885,227	+2·4	72,661	+7·6

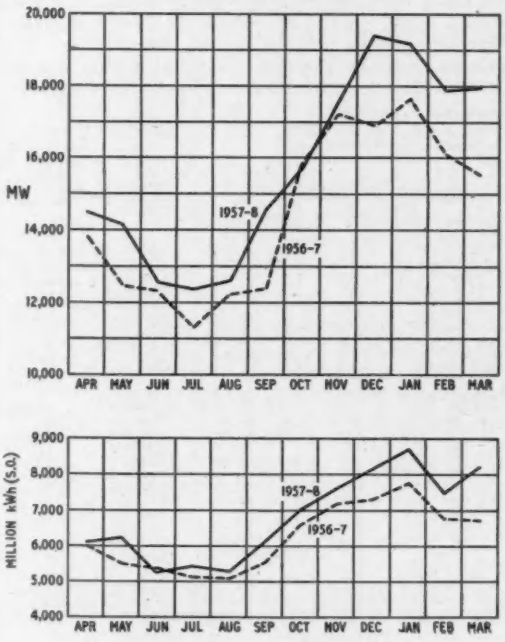
electrification proceeds the rate of growth will be accelerated.

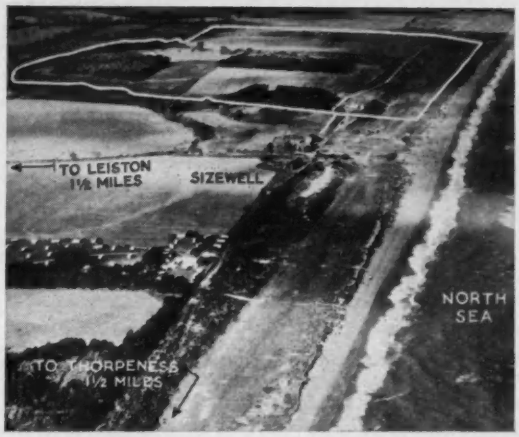
The increase in the maximum demand charge and the reduction in the running charge of the bulk supply tariff applied to Area Boards reflects the higher fixed costs and lower operating costs of the newer generating plant.

[This week the C.E.G.B. announced a reduction in the running charge from 0·47d to 0·46d/kWh.]

As usual there was a wide range of bulk supply load factors as between the twelve Boards; the highest was

Monthly Maximum Demand and Monthly Output *:—The two upper curves show the average demand for electricity on the power stations over the half-hour of maximum demand in each month. The two lower curves show the quantity of electricity sent out from the stations in each month*





Site of the Central Electricity Generating Board's proposed nuclear generating station in Suffolk (see page 628)

that of the South Wales Board (59·9 per cent) and the lowest that of the London Board (40·1 per cent).

At the end of 1957-58 only two Area Boards were without a complete range of published standard commercial and industrial tariffs and the standardisation of farm tariffs was to be completed with the introduction on 1st April, 1958, of the South Eastern Board's tariff. From the same date this Board was also introducing standard tariffs for industrial and commercial consumers and for church and community hall supplies. As all the Boards have standard domestic tariffs there remain very few cases where retail tariffs do not broadly conform with the recommendations of the Retail Tariffs Committee in its 1951-52 report. Hence the complicated task of standardisation, initiated soon after nationalisation, has now been virtually completed throughout England and Wales.

Off-peak loads are being encouraged by the promotional restricted-hour tariff rates now offered by all the Boards. Floor warming is being introduced into many types of premises and storage block heaters are being increasingly installed in commercial and industrial premises. Because of increased costs all the Boards were compelled to increase their prices during 1957-58.

Rural electrification is shown to have made further progress and at 31st March 72·8 per cent of farms were connected. In the London Area (a rather special case) all the farms are now on the mains; the next best is 88·9 per cent in the East Midlands Area. Nevertheless, the average farm consumption is low and one farm in six uses less than 1,000 kWh a year. Supplies had been made available to 80 per cent of other rural premises at 31st March last. The application of electricity to commercial horticulture proceeded at a good pace during the year.

Reference is made to utilisation research. A final report was made on the 1955 sample survey of domestic consumers and work was completed on the statistical analysis of a large sample of industrial consumers. The national sample survey of commercial consumers was nearing completion by the end of the year.

Comparative heating tests are being conducted in ten Area Board and Division office buildings of thermal-storage block heaters and comparative trials were arranged in schools. With the co-operation of the local authority, and with the consent of the Customs and Excise Department, a trial was started in a group of dwelling

TABLE 5. ANALYSIS OF AREA BOARDS' SALES

Board	Population at 30.6.57 (Thous.)	No. of consumers (nearest thous.)	Sales of Electricity (Thousands of kWh)							
			Domestic	Farm	Commercial	Industrial	Public Lighting	Traction	Total Sales*	Inc. over 1956-57 per cent
London	4,990	1,747	2,682,487	567	2,020,727	1,744,798	111,340	44,395	6,604,314	4·6
S. Eastern	3,408	1,191	2,153,485	91,726	696,591	1,312,497	45,212	18,549	4,318,060	6·3
Southern	3,987	1,303	2,239,482	177,001	723,304	2,213,235	41,147	19,986	5,540,791	10·3
S. Western	2,156	737	1,084,350	94,906	542,488	941,612	25,070	—	2,688,426	6·8
Eastern	5,097	1,700	3,024,666	168,820	944,286	2,690,351	60,534	39,123	7,085,877	8·4
E. Midlands	3,810	1,276	1,742,759	169,876	534,631	3,365,571	48,891	20,573	5,998,788	7·4
Midlands	4,238	1,380	2,123,253	142,868	697,557	4,636,208	53,268	19,312	7,837,162	8·5
S. Wales	2,006	611	724,142	41,844	349,445	3,494,635	27,675	9,426	4,647,167	7·2
Merseyside & N. Wales	2,896	888	1,246,040	89,018	588,265	2,688,525	40,802	20,608	4,748,664	7·2
Yorkshire	4,230	1,470	1,805,311	101,693	642,308	5,106,435	62,394	83,287	7,978,192	7·5
N. Eastern	3,034	991	1,075,338	63,990	496,484	2,839,187	36,812	56,309	4,568,120	8·7
N. Western	4,573	1,591	2,206,830	137,198	823,518	4,595,427	76,667	31,496	8,084,752	5·6
Totals	44,425	14,885	22,108,143	1,279,507	9,059,604	35,628,481	629,812	363,064	70,100,313	7·3

* Including combined domestic and commercial supplies as follows (thous. kWh):—Southern, 126,636; Eastern, 158,097; East Midlands, 116,487; Midlands, 164,696; Merseyside and N. Wales, 75,406; Yorkshire, 176,764; North Western, 213,616.

houses on the suitability of thermal-storage block heaters, which hitherto have been exempt from purchase tax as their use is confined to commercial and industrial premises.

Other trials involved the observation of the operation of floor heating in flats and floor heating and larder heat-pumps in six experimental houses.

The supply industry continued to take an active part in the standardisation of a wide variety of appliances and accessories. Particulars are given of these activities and of the patenting of inventions made within the industry.

As is customary, several pages of the report are devoted to "Employment, Staff Relations and Education." At 31st March last the total number of employees was 185,468 (against 182,936 in March, 1957) of whom 0·7 per cent were "managerial and higher executive," 8·8 per cent technical engineering, 22·3 per cent executive, clerical, accountancy, sales, etc., 63·9 per cent manual and 4·3 per cent technical trainees and apprentices. The 1·4 per cent increase in the number of employees was accompanied by increases of 8·2 per cent in maximum output capacity of the power stations, 2·4 per cent in the number of consumers and 7·6 per cent in the sales of electricity.

Activities in connection with terms and conditions of employment; joint consultation; safety, health and welfare; and education and training are recorded.

Trading Results

The surplus of the industry for the full year 1957-58 was £16,062,039. For the first nine months there was a deficit, but that was because the most remunerative quarter of the year was excluded. The following figures relate to the full year.

In 1957-58 the Central Electricity Authority and the C.E.G.B. had a trading revenue of £340·26 million (against £298·41 million in 1956-57) and a total expenditure on generation, purchase of electricity and main transmission of £316·04 million (£279·39 million), leaving a balance of £24·22 million (£19·02 million).

The principal item on the revenue side was sales of electricity, £464·29 million (against £413·21 million). On the expenditure side generation costs and purchase of electricity accounted for £230·63 million (£205·93 million). After meeting administration and other expenses the surplus was £13·13 million (£8·85 million) before transfers to reserves.

Adding a surplus of £2·93 million from the Area Boards gives a total of £16·06 million. Taxation reserves receive £2·69 million, supplementary reserves for depreciation of fixed assets £11·82 million, the generating reserve fund £2·03 million and Area reserve funds £0·89 million, and a deficit of £1·36 million is deducted from balances brought forward.

At 31st December, 1957, the C.E.A. had reserves totalling £55·48 million. Of this the Area Boards received £12·15 million (from the £16 million Central Reserve Fund) and the rest went to the Central Electricity Generating Board. The value of the industry's fixed assets at 31st March last was £1,473·94 million of which the Area Boards were responsible for £513·47 million.

TABLE 6. AREA BOARDS' FINANCIAL RESULTS

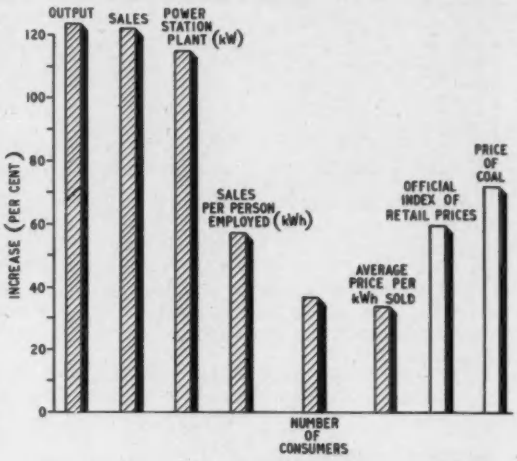
Area Boards	Year	Trading Revenue	Trading Expenditure	Surplus from Trading		Other Income	Interest and Financing Expenses	Surplus, or Deficit (—), before Transfers to Reserves
				Amount	Percentage of Trading Revenue			
		£	£	£	per cent	£	£	£
London	1957–58	55,951,756	52,723,942	3,227,814	5·77	281,165	2,053,151	1,455,828
	1956–57	*50,230,380*	*47,824,821*	*2,405,559*	*4·79*	*278,261*	*1,856,804*	*827,016*
South Eastern	1957–58	31,619,143	31,354,998	264,145	0·84	185,527	1,256,494	—806,822
	1956–57	*28,840,771*	*27,477,283*	*1,363,488*	*4·73*	*212,811*	*1,138,048*	*438,251*
Southern	1957–58	38,762,260	37,207,326	1,554,934	4·01	176,817	1,849,242	—117,491
	1956–57	*35,069,472*	*32,834,596*	*2,234,876*	*6·37*	*203,458*	*1,658,686*	*779,648*
South Western	1957–58	20,733,648	19,587,668	1,145,980	5·53	139,484	1,057,753	227,711
	1956–57	*18,595,701*	*17,417,321*	*1,178,380*	*6·34*	*134,646*	*975,722*	*337,304*
Eastern	1957–58	51,285,880	48,218,108	3,067,772	5·98	463,418	2,725,112	806,078
	1956–57	*45,160,071*	*42,968,586*	*2,191,485*	*4·85*	*442,705*	*2,482,451*	*151,739*
East Midlands	1957–58	37,223,866	35,444,483	1,779,383	4·78	131,827	1,974,076	—62,866
	1956–57	*33,407,912*	*31,711,742*	*1,696,170*	*5·08*	*123,947*	*1,794,289*	*25,828*
Midlands	1957–58	47,821,338	46,586,164	1,235,174	2·58	252,565	2,130,329	—642,590
	1956–57	*42,278,572*	*40,872,558*	*1,406,014*	*3·33*	*266,295*	*1,954,199*	*—281,890*
SouthWales	1957–58	25,236,824	23,568,045	1,668,779	6·61	93,896	1,242,295	520,380
	1956–57	*22,175,805*	*21,049,458*	*1,126,347*	*5·08*	*96,520*	*1,089,148*	*133,719*
Merseyside and North Wales	1957–58	28,762,505	28,017,270	745,235	2·59	153,288	1,044,345	—145,822
	1956–57	*25,678,948*	*25,010,746*	*668,202*	*2·60*	*141,762*	*907,372*	*—97,408*
Yorkshire	1957–58	45,224,399	42,440,195	2,784,204	6·16	270,309	2,129,338	925,175
	1956–57	*39,040,767*	*37,846,535*	*1,194,232*	*3·06*	*318,691*	*1,954,424*	*—441,501*
North Eastern	1957–58	28,255,027	26,841,486	1,413,541	5·00	156,858	1,246,620	323,779
	1956–57	*25,533,586*	*23,795,391*	*1,738,195*	*6·81*	*170,784*	*1,118,150*	*790,829*
North Western	1957–58	50,031,020	47,897,693	2,133,327	4·26	290,497	1,977,272	446,552
	1956–57	*45,420,113*	*43,638,059*	*1,782,054*	*3·92*	*282,860*	*1,858,964*	*205,950*
Totals	1957–58	459,861,412*	438,841,124*	21,020,288	4·57	2,595,651	20,686,027	2,929,912
	1956–57	*410,181,851**	*391,196,849**	*18,985,002*	*4·63*	*2,672,740*	*18,788,257*	*2,869,485*

* These totals exclude inter-Area Board bulk supplies: 1957–58, £1,046,254; 1956–57, £1,250,247.

As mentioned above, the aggregate surplus of the Area Boards was £2·93 million. Table 6 shows how this was arrived at. It will be seen that in 1957-58 five Boards incurred deficits before transfers to reserves; after these transfers only two Boards had favourable balances for the year. The deficits were made good by balances brought forward and transfers from the Central Reserve Fund. Tables 7 and 8 present details of the Boards' contracting and trading accounts.

Table 9 shows revenue per kWh for the various classes of consumers. The average revenue in d/kWh received by the Boards (excluding inter-Board sales) was as follows: London 1·994 (against 1·870 in 1956-57); South Eastern 1·669 (1·615); Southern 1·653 (1·641); South Western 1·815 (1·740); Eastern 1·711 (1·637); East Midlands 1·456 (1·402); Midlands 1·444 (1·386); South Wales 1·296 (1·220); Merseyside and North Wales 1·435 (1·373); Yorkshire 1·347 (1·247); North Eastern 1·471 (1·436); North Western 1·463 (1·400); all Boards 1·551 (1·484).

The industry's statutory borrowing powers of £1,400 million were exercised to the extent of £132 million in 1957-58 which brought the total amount borrowed to £1,140 million. The balance of £260 million is fully occupied by outstanding commitments estimated at £571 million. The Government is to make proposals to



Percentage increases in output, sales, prices, consumers, etc., since 1947-48 (pre-vesting)

TABLE 7. ELECTRICAL CONTRACTING AND SALES OF FITTINGS TRADING ACCOUNTS

Area Boards	Contracting: Sales: Cash and Credit	Contracting: Sales: H.P. and Similar Sales	Contracting: Sales: Total	Contracting: Direct Cost of Sales: Materials	Contracting: Direct Cost of Sales: Wages, Superannuation, etc.	Contracting: Direct Cost of Sales: Transport	Contracting: Direct Cost of Sales: Total	Contracting: Gross Profit	Sales of Fittings: Sales: Cash and Credit	Sales of Fittings: Sales: H.P. and Similar Sales	Sales of Fittings: Sales: Total	Sales of Fittings: Direct Cost of Sales	Sales of Fittings: Gross Profit	Total Gross Profit
	£	£	£	£	£	£	£	£	£	£	£	£	£	£
London ...	1,766,355	94,986	1,861,341	763,344	707,758	32,277	1,504,379	356,962	909,094	1,048,832	1,957,926	1,582,484	375,442	732,404
S. Eastern ...	1,233,519	49,444	1,282,963	515,109	398,365	1,155	914,629	368,334	1,237,340	1,377,307	2,614,647	2,054,920	559,727	928,061
Southern ...	1,726,602	159,238	1,885,840	738,690	595,214	66,873	1,400,777	485,063	1,479,836	1,166,076	2,645,912	2,065,504	580,408	1,065,471
S. Western...	997,029	67,410	1,064,439	414,880	350,084	33,872	798,836	265,603	1,015,086	990,290	2,005,376	1,563,433	441,943	707,546
Eastern ...	2,499,038	280,328	2,779,366	1,288,458	802,316	51,833	2,142,607	636,759	2,148,423	2,784,506	4,932,929	3,852,354	1,080,575	1,717,334
E. Midlands...	574,749	95,251	670,000	343,831	172,999	19,342	536,172	133,828	586,441	739,554	1,325,995	1,049,129	276,866	410,694
Midlands ...	2,345,044	344,615	2,689,659	1,408,075	671,963	71,462	2,151,500	538,159	1,328,112	2,566,631	3,894,743	3,066,227	828,516	1,366,675
S. Wales ...	530,654	92,843	623,497	303,193	174,240	5,173	482,606	140,891	404,382	566,146	970,528	800,894	169,634	310,525
Merseyside & N. Wales ...	638,532	106,900	745,432	344,452	232,543	11,993	588,988	156,444	596,500	1,085,157	1,681,657	1,330,975	350,682	507,126
Yorkshire ...	1,077,143	158,796	1,235,939	630,843	312,163	27,922	970,928	265,011	739,177	1,232,052	1,971,229	1,596,081	375,148	640,159
N. Eastern ...	476,916	73,650	550,566	335,780	121,243	5,193	462,216	88,350	426,382	666,026	[1]1,092,408	863,565	228,843	317,193
N. Western	1,193,224	249,939	1,443,163	672,818	403,135	37,554	1,113,507	329,656	1,179,713	2,727,670	3,907,383	3,131,077	776,306	1,105,962
Total ...	15,058,805	1,773,400	16,832,205	7,759,473	4,942,023	365,649	13,067,145	3,765,060	12,050,486	16,950,247	29,000,733	22,956,643	6,044,090	9,809,150

TABLE 8. CONTRACTING AND SALES OF FITTINGS NET REVENUE ACCOUNTS

Area Boards		Gross Profit (from Trading Account)	Indirect Costs*	Surplus or Deficit (−)	Percentage to Total Sales: Gross Profits	Percentage to Total Sales: Indirect Costs*	Percentage to Total Sales: Surplus or Deficit (−)	Estimates of Rents, Rates and Insurance	Surplus or Deficit (−) after Charging Rents, Rates and Insurance
		£	£	£	%	%	%	£	£
London	1957-58	732,404	630,675	101,729	19·2	16·5	2·7	27,000	74,729
	1956-57	*683,629*	*623,551*	*60,078*	*19·6*	*17·9*	*1·7*	*29,000*	*31,078*
South Eastern	1957-58	928,061	664,537	263,524	23·8	17·0	6·8	40,800	222,724
	1956-57	*839,688*	*615,132*	*224,556*	*24·0*	*17·6*	*6·4*	*38,500*	*186,056*
Southern	1957-58	1,065,471	810,619	254,852	23·5	17·9	5·6	60,600	194,352
	1956-57	*958,938*	*749,437*	*209,501*	*23·6*	*18·4*	*5·2*	*57,700*	*151,801*
South Western	1957-58	707,546	548,306	159,240	23·1	17·9	5·2	37,900	121,340
	1956-57	*655,927*	*550,873*	*105,054*	*23·0*	*19·3*	*3·7*	*37,400*	*67,654*
Eastern	1957-58	1,717,334	1,420,135	297,199	22·3	18·4	3·9	68,000	229,199
	1956-57	*1,448,096*	*1,334,181*	*113,915*	*21·2*	*19·5*	*1·7*	*67,700*	*46,215*
East Midlands...	1957-58	410,694	330,633	80,061	20·6	16·6	4·0	24,400	55,661
	1956-57	*373,712*	*309,644*	*64,068*	*20·5*	*17·0*	*3·5*	*22,900*	*41,168*
Midlands	1957-58	1,366,675	1,225,924	140,751	20·8	18·6	2·2	64,300	76,451
	1956-57	*1,251,791*	*1,178,448*	*73,343*	*20·6*	*19·4*	*1·2*	*63,000*	*10,343*
South Wales	1957-58	310,525	362,605	(−)52,080	19·5	22·8	(−)3·3	18,300	(−)70,380
	1956-57	*309,603*	*341,354*	(−)*31,751*	*20·7*	*22·8*	(−)*2·1*	*19,600*	(−)*51,351*
Merseyside and North Wales ...	1957-58	507,126	410,135	96,991	20·9	16·9	4·0	33,900	63,091
	1956-57	*414,552*	*358,665*	*55,887*	*19·2*	*16·6*	*2·6*	*34,700*	*21,187*
Yorkshire	1957-58	640,159	590,408	49,751	20·0	18·4	1·6	35,200	14,551
	1956-57	*574,041*	*508,099*	*65,942*	*19·6*	*17·4*	*2·2*	*33,300*	*32,642*
North Eastern	1957-58	317,193	230,527	86,666	19·3	14·0	5·3	24,800	61,866
	1956-57	*271,134*	*210,570*	*60,564*	*18·7*	*14·5*	*4·2*	*21,900*	*38,664*
North Western	1957-58	1,105,962	852,960	253,002	20·7	16·0	4·7	59,300	193,702
	1956-57	*964,542*	*743,028*	*221,514*	*20·7*	*15·9*	*4·8*	*56,100*	*165,414*
Total	1957-58	9,809,150	8,077,464	1,731,686	21·4	17·6	3·8	494,400	1,237,286
	1956-57	*8,745,653*	*7,522,982*	*1,222,671*	*21·2*	*18·2*	*3·0*	*481,800*	*740,871*

* Salaries, wages, superannuation, etc.; transport and travelling; sundry purchases and expenses; publicity, exhibitions, etc.; bad and doubtful debts; and proportion of general charges.

TABLE 9. REVENUE PER KWH SOLD (PENCE)

Class	1956-57	1957-58
Industrial	1·265	1·313
Commercial	2·016	2·086
Domestic	1·581	1·673
Combined domestic and commercial	1·778	1·879
Farm	1·521	1·583
Traction	1·230	1·271
Public lighting	1·518	1·562
All classes	1·469	1·534

Parliament for increasing the borrowing limit of the industry.

Capital expenditure in 1957-58 totalled £240·14 million (Area Boards £83·40 million); depreciation and other capital provisions amounted to £79·74 million (Area Boards £38·98 million) and the addition to fixed assets (less depreciation, etc.) was £160·40 million (Area Boards £44·42 million).

The Area Boards have produced separate reports for the past year and these will be reviewed in our next issue.

Minister's Report

The statutory report of the Minister of Power (Lord Mills) records the dissolution of the Central Electricity Authority on 1st January, 1958, and the setting up of, and appointments to, the Electricity Council and Central Electricity Generating Board. It covers the period 1st April to 31st December, 1958, which is a financial year under the Electricity Act, 1957.

The Minister issued regulations to provide for the issue of British Electricity stock by the Electricity Council and for the handling and redemption of such stock as well as British Electricity stock issued by the C.E.A. Following the Government's decision that capital expenditure in the public sector as a whole should be held to its 1957-58 level, the Minister approved capital expenditure by the C.E.G.B. and the Area Boards for the twelve months commencing 1st April, 1958, at £239 million, which means that work on new power stations previously planned for the 24 months from that date will be spread over 26 months. Similarly, completion of the nuclear power programme will now be postponed by a year.

The C.E.A.'s plans were approved for the commissioning of 2,250 MW in 1963, but the Minister asked the Board to limit the orders placed to 90 per cent of the programme for that year pending a long-term review of investment. Changes in the plans for the oil-firing of power stations will reduce the estimated consumption of oil in the early 1960's by between 1½ and 2 million tons a year. The rising expenditure on research and development is stated to be an indication of the more extensive work being carried out by the Area Boards in this field, and the combined research programme of the C.E.A. and Area Boards included provision for research into the operational problems of nuclear power stations for which special laboratories are being constructed.

During the period the Minister advanced £86 million to the C.E.A. towards their requirements for long-term capital finance. In December, 1957, the consent given, with Treasury approval, to the C.E.A. for temporary borrowings from the banks or other persons of sums not exceeding £50 million outstanding at any one time, was extended to the Electricity Council. In addition, the Council was given consent and approval to borrow temporarily between 1st January and 31st March, 1958, sums not exceeding £15 million from the trustees or committees of various superannuation and pension schemes established by them or the Electricity Boards in England and Wales, and sums not exceeding £500.000 from subsidiary companies of which the whole share capital was beneficially owned by the Council or Boards in England and Wales. Consent and approval were also given to the employment within the industry of contributions carried to various redemption funds during the period, provided these were replaced out of the proceeds of the next stock issue, or as the Minister or Treasury might later require.

Particulars are given of compulsory purchase orders made by the C.E.A. and Area Boards, and of the consents given to the erection or extension of power stations. These included the Hinkley Point nuclear station and the 1,000 MW conventional station at West Thurrock, Essex. Extensions at Uskmouth "B," Padiham "B," Rugeley "B" and Willington "B" total 1,360 MW. Consent was also given to the 3,750 kW underground gasification project at Newman Spinney.

Welding Research

THE Council of the British Welding Research Association has published its report for the year 1957-58, the first full year during which all the Association's researches have been conducted at Abington Hall, near Cambridge. The report covers the various subjects on which work has been carried out and outlines the proposed five-year research programme.

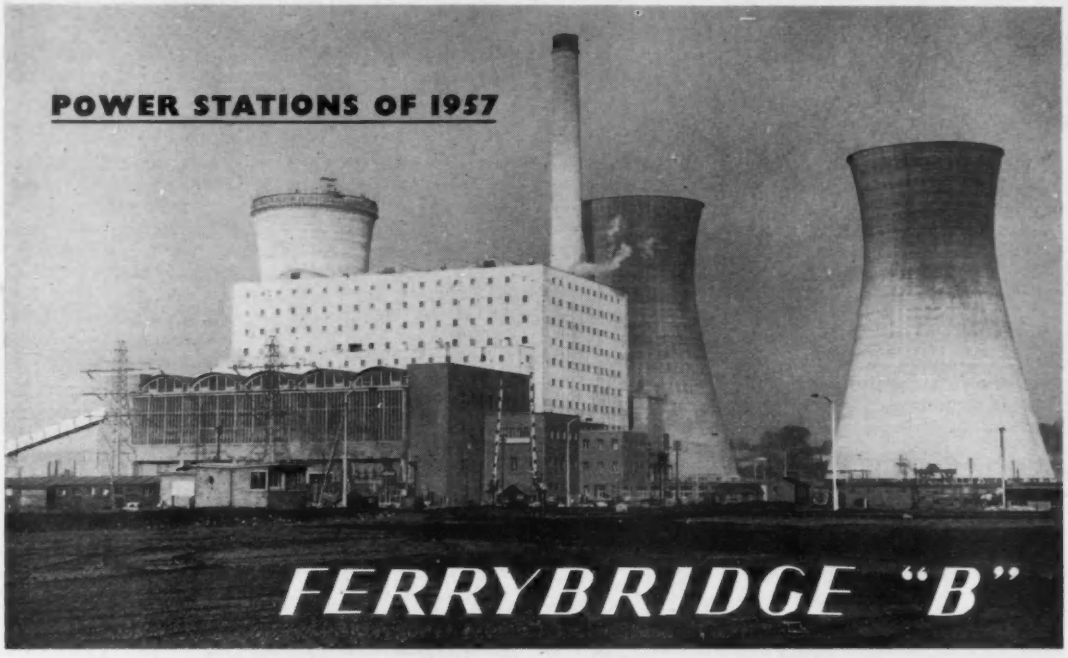
Fundamental research has been undertaken into gas-shielded arc welding, resistance welding and non-destructive testing. The mechanism of metal transfer in the welding arc has been studied, and a relationship between arc voltage, current, penetration, wire burn-off rate and power source characteristic established. The effect of arc-shielding gases on the relation between welding current and melted plate area has also been examined, the greatest area being obtained with carbon dioxide or carbon dioxide/oxygen mixtures. A formula for estimating r.m.s. current for resistance welding steels which harden under severe heating and cooling conditions has been evolved and verified experimentally, and heat distribution in the weld, and the effect of cyclic heating and cooling on the mechanical properties of the weld, are also being investigated.

The research into the properties of mild steel weld metal, begun in 1944, has been continued, and preliminary electron microscope studies undertaken to obtain information on the causes of hot cracking in such welds. Sheet steel laminations from 24 s.w.g. to 10 s.w.g. have been assembled by projection welding a low-carbon steel wire inserted into a shallow slot milled across the clamped laminations. The Association's code of practice for projection welding has been issued to members as a revision of publication T. 30/50. Other ferrous research subjects include welding low alloy steels, austenitic stainless steels and heat resisting steels and alloys.

A satisfactory technique for welding high strength aluminium alloys in certain applications is among the results obtained from research into non-ferrous metals. Porosity in argon-arc welded 18 s.w.g. phosphor-deoxidised copper is due to insufficient residual deoxidant in the parent metal, and the use of zinc-deoxidised copper as an alternative is being considered with encouraging preliminary results. Most joints in tough-pitch high-conductivity copper used in the electrical industry at present are brazed, bolted and riveted, but work is now being carried out on problems associated with welding such copper, including weld porosity and oxide migration in the heat affected zone. Research in other non-ferrous subjects includes welding titanium and zirconium alloys and cold pressure welding of pure aluminium, sintered aluminium powder and copper.

Fatigue research into the weld strength of butt welds in steel and aluminium alloys has been undertaken, and work on pressure vessels has been continued to determine the stresses acting within a vessel and their effect on its material and performance.

The work carried out by the Board's advisory service is dealt with and the report is concluded with appendices giving details of committee membership, papers and publications produced and a list of members.



The three 100 MW turbo-alternator/boiler units at Ferrybridge "B" operate on the reheat cycle. This and other features of the power station are described in detail. The station, which is situated near Pontefract, contains three Parsons turbo-alternators and two Stirling and one Babcock & Wilcox boilers, with steam conditions at the turbine stop valve of 1,500 p.s.i. and 975 deg F with reheat to 955 deg F at 432 p.s.i.

ONE of the most interesting features of Ferrybridge "B" power station, which is being built near Pontefract in South Yorkshire by the Northern Project Office of the Central Electricity Generating Board, is that the three 100 MW turbo-alternator/boiler units operate on the reheat cycle. The steam conditions at the turbine stop valve are 1,500 p.s.i. and 975 deg F with reheat to 955 deg F at 432 p.s.i. The original planning and construction work on this station was, of course, carried out until the end of last year by the Yorkshire Division of the Central Electricity Authority.

The station is on a site of 130 acres which was purchased by the Yorkshire Electric Power Company in 1918. At that time the land was flooded and was used for growing willows when basket making was a thriving local industry. Before construction of the station the level of the site was raised above flood level by ash from Ferrybridge "A" power station. The station is well situated in that the site is bounded on two sides by the River Aire, which at this point is navigable, and the British Railways' Doncaster to York main line, giving an adequate supply of cooling water and facilities for coal delivery which, in the main, will be by barge from local collieries. Ash is disposed of at Brotherton Ings nearby, on land which has been subsiding for many years. It is intended to fill this area to a high level with ash pumped from the power station between banks made of spoil from Fryston colliery. When filled the area will be covered with soil to bring the land back into use.

The main station building and plant are supported on a total of about 3,500 piles driven into underlying limestone. The turbine house is 250ft by 121ft by 81½ft high and its reinforced concrete framework and roof is in seven bays spanning 121ft from centre to centre of columns. The height from ground level to the underside of the roof beams at the centre is 68½ft. The roof is of the shell type, 3½in thick. The structure supports a 150 ton travelling crane spanning 113ft crane rail centres only 46ft above ground level. This is very low and has been made possible by providing two unloading bays with railway tracks between Nos. 1 and 2 and Nos. 2 and 3 machines. This reduction in the height of the crane has also resulted in a reduction in the height of the turbine house and the loading on the foundations due to dead load and crane loading.

The boiler house is of steel-framed construction 250ft long by 167ft wide and 169ft high, containing 3,900 tons of steel, with asbestos for the walls and corrugated steel sheeting for the roof. Concrete work is carried up to the firing floor level to reduce the cost and also enable

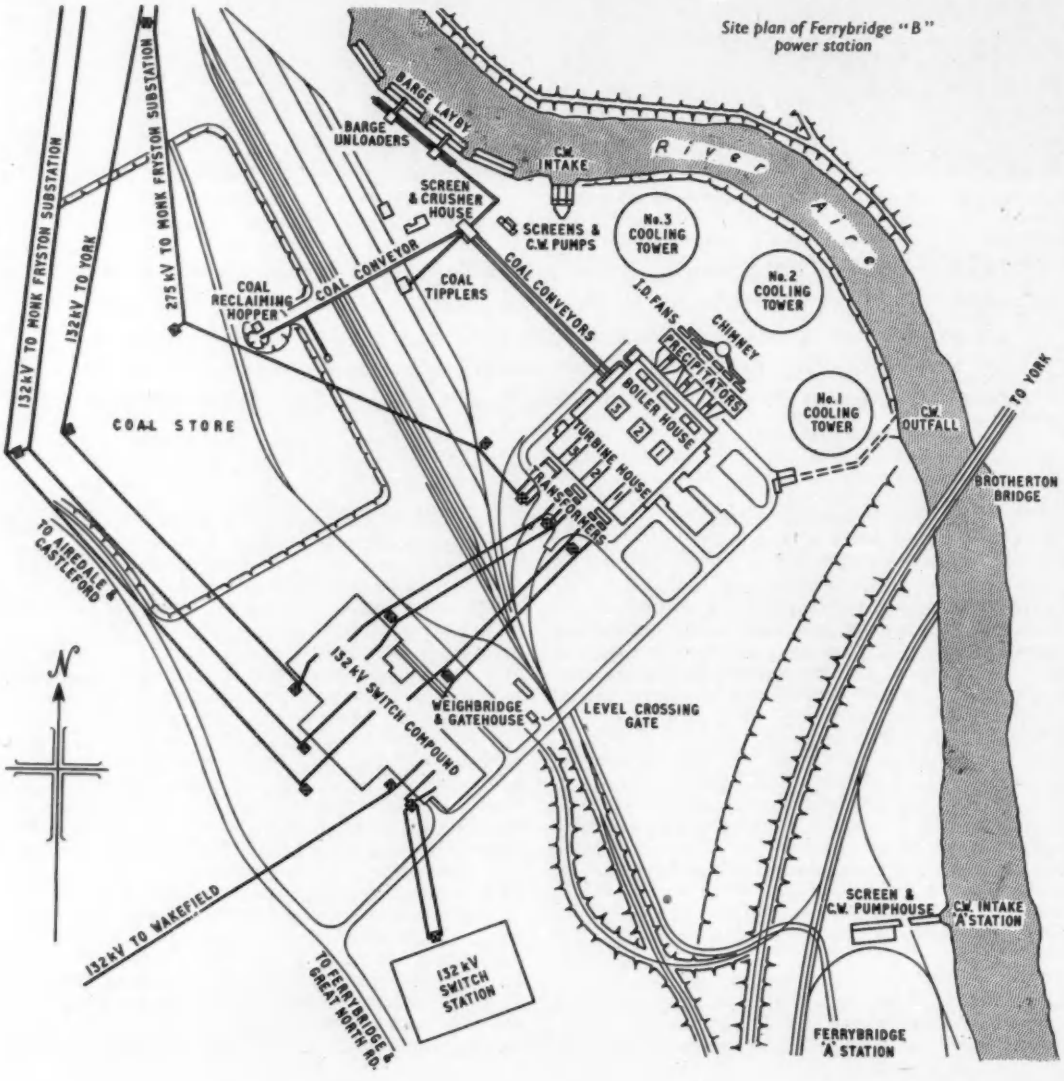
the boiler material to pass under while structural steelwork was being erected 30ft above. The hogback girders in the roof, from which the boilers are suspended, are of high tensile steel. The building volume is 31 cu ft/kW and the construction of the station has cost about £49/kW of installed capacity.

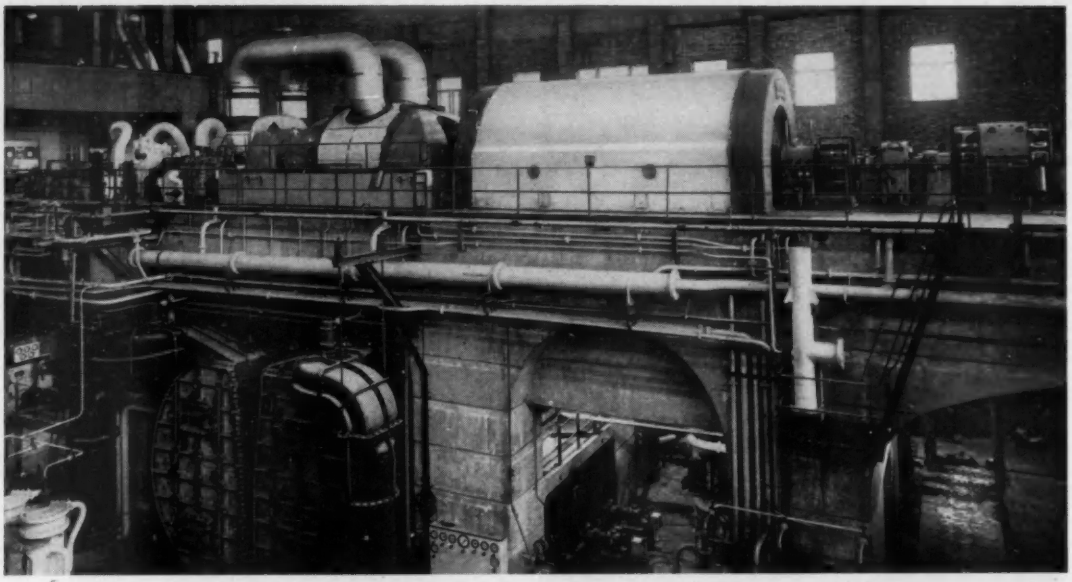
Coal Handling Plant

As already mentioned, fuel supplies will mainly be delivered by barge from nearby collieries, but facilities are also provided to deal with road and rail deliveries if required. Waterborne coal arrives at the jetty at the north end of the site where two unloaders grab the coal from the barges and transfer it to the belt conveyor system at the maximum rate of 2,400 tons per day. From the jetty the belt takes the coal to a junction tower from which it can either go via a reversible belt to the 220,000 tons capacity storage area or through magnetic separators and screening and crushing plant on its way to the boiler bunkers. Rail wagon tipplers deal with railborne coal at the rate of 1,600 tons per day and this again is transferred by belt to the junction tower. The ground hopper in the storage area accommodates coal delivered by road; this hopper is also used for reclaiming from the store. The coal handling plant was supplied and installed by Mitchell Engineering, Ltd.

On arrival at the bunker level, coal is fed on to shuttle conveyors which may be automatically controlled to feed one or more bunkers as desired. The boiler bunker system is unusual in that it is a single structure of catenary cross-section which is divided into three parts, each of 1,250 tons capacity. Each bunker section is associated with one boiler and coal is fed through chutes to Simon automatic weighers and on down to five Type E70 Babcock & Wilcox pulverising mills, each of which has a maximum capacity of 12 tons and is driven by a 150 h.p., 580 r.p.m., 415 V induction motor supplied by the Electric Construction Co., Ltd.

These mills are of the pressure type and receive air from individual Davidson "Sirocco" primary air fans





100 MW Parsons turbo-alternator. Steam is reheated before entering the i.p. chamber

driven by 180 h.p., 1,480 r.p.m., 415 V, E.C.C. induction motors. Coal is fed to the mills by two-speed rotor table feeders which are integral with the mills. Two air heaters of the Stirling tubular type are provided in each boiler. The pulverised fuel is conveyed from the mills to twenty 26in horizontal circular type burners in the front wall of each boiler. Although five p.f. mills are provided, under normal full-load conditions only four of these will be required.

In addition to the main p.f. equipment, there are twelve pressure-atomising oil burners with automatic spark ignition and these are also fitted in the front wall of the boiler. This equipment is capable of carrying 10 per cent m.c.r. and is automatic in operation with limited control from the unit console which is situated between the turbine and boiler at operating floor level. The pressure of oil to the burners is 350 p.s.i. and the maximum capacity of each burner is 1,000 lb/hr. As part of the ancillary equipment there are two 80 ton oil storage tanks with provision for heating by twelve 2·5 kW immersion heaters in each tank and by waste heat from boiler blow-down. This waste heat recovery is obtained by passing flash steam from the blow-down tank through central vents in each fuel oil tank. There are two oil pumps for transferring oil from one tank to the other or handling oil delivered by rail. In addition, there are two pressure pumps, and two pumping and heating units with associated equipment. After combustion has taken place in the boiler furnaces the resultant ash is collected in a single water-sealed ash hopper from which it is removed by a John Thompson ash sluicing system and is conveyed by high-pressure water jets to the ash sump in the ash plant house. Dust from the economiser, superheater, mechanical extraction plant, and precipitator hoppers is removed by the ejector system and conveyed by high-pressure water jets to the ash sump. The ash and dust is then pumped via twin ash discharge lines to the disposal area at Brotherton Ings about a mile away.

Two 2,100 gal/min high-pressure sluicing water pumps are provided, driven by 250 h.p., 1,475 r.p.m., 415 V, L.D.C. induction motors, for conveying the ash and dust to the sump. The four 2,300 gal/min ash disposal pumps are driven by 190 h.p., 1,480 r.p.m., 415 V, L.D.C. induction motors.

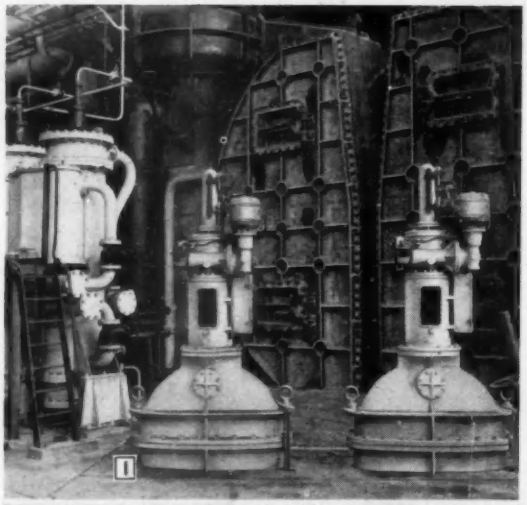
Steam Raising Plant

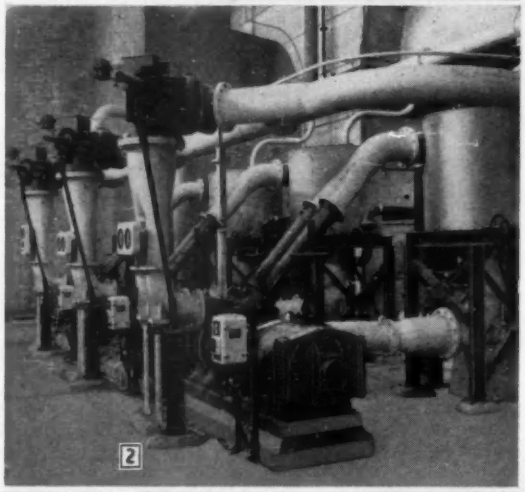
The completed station will accommodate two Stirling single-drum radiant reheat type natural circulation boilers, each with maximum continuous rating of 760 klb/hr at 1,600 p.s.i. and 985 deg F with reheat from the turbine h.p. cylinder exhaust to 955 deg F at 432 p.s.i. and one Babcock & Wilcox radiant type boiler. The final feed temperature at m.c.r. is 435 deg F.

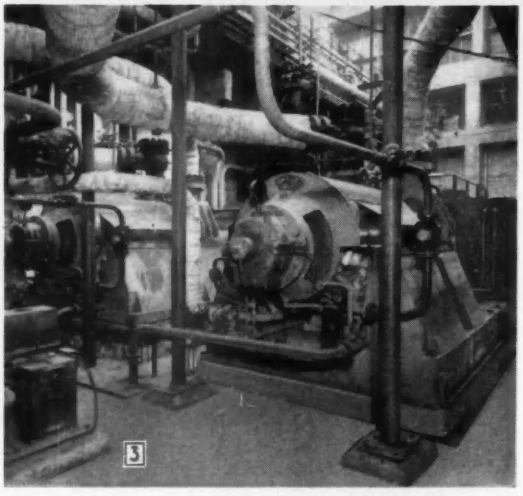
Each Stirling unit consists of radiant boiler, primary and secondary superheaters, reheater, economiser, air heaters and draught equipment. The combustion chamber is completely water-cooled, the wall tubes continuing down to the ash hopper where the water seal is effected between the hopper and the boiler setting. These tubes are covered with refractory where necessary and form the furnace walls. It is of interest to note that no metal casing has been provided for the exterior of the boiler. The outer tubes are first covered with 1in of high-temperature refractory, then 2½in of glass fibre block supported by ½in mesh expanded metal. This is covered with a ¼in layer of hard-setting cement which is finally covered by ⅛in of emulsified bitumen.

The boiler drum, water walls, boiler, superheater and reheater are suspended from the main building steelwork so that all expansion takes place downwards; the total weight carried on the structure is slightly in excess of 3,000 tons. Each boiler drum is 49ft long with a 66in bore and is fusion welded from mild steel 5¼in thick; it has a total weight of 97 tons. The effective surface of the water-cooling tubes exposed to radiant heat is 13,000 sq ft while the boiler heating surface is 3,650 sq ft. A steam tube walled enclosure at the rear of the boiler contains a three-stage superheater and two reheat banks.

A Bailey control system is installed to assist the boiler operator to maintain steam quantity and quality, correct combustion conditions and safe operation. The auto-







1. *Parsons condensers, showing c.w. valves in foreground.*
2. *Air extraction pumps.* 3. *Boiler feed pump*

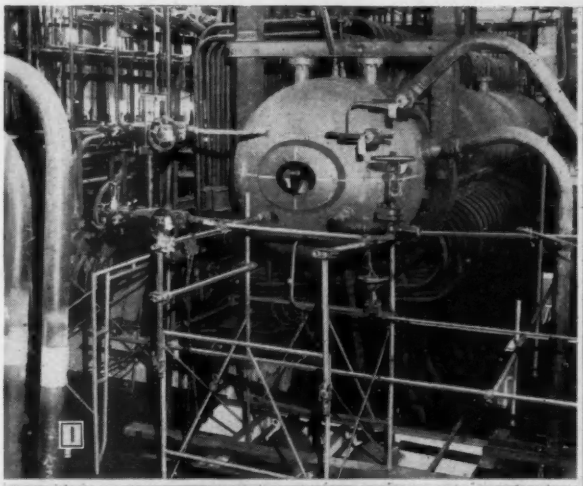
matic control is sensitive to small changes in main steam flow, pressure and temperature, reheat steam temperature, feed water flow, combustion chamber draught, mill outlet fuel/air temperature and the coal feed to the mills. The response of the Bailey control to changes in these factors is partly "built-in." The effective range of the control is, however, limited; for example, the operator must select the number of mills in service for the load. Compressed air is used for the operation of the control system for both control and power and this air is supplied by three compressors on a common system. One or two of these will normally run to supply the air required with the remainder as standby. The compressors discharge at 100 p.s.i. into two large-capacity receivers which hold sufficient reserve to maintain the automatic system in operation for approximately 30 min if the compressors fail. A low-pressure alarm is fitted. The control air system requires a working pressure of 30 p.s.i. and the power air 40 p.s.i. The control mechanism converts the input signal to an equivalent air pressure which operates the "Pilotrol" air relay. This relay adjusts the power air pressure which is used to operate the damper air flow control device to bring the controlled factor back to its correct value. The correct value of the loading air pressure is arranged to correspond to 15 p.s.i. Superheat steam temperature control is by means of two direct contact spray type attemperators, the quantity of spray being varied as necessary. The spray water valve is operated by power air on the diaphragm coming against a spring. Control of reheat steam temperature is obtained by variation of the gas quantity passing through the reheat section by means of gas dampers.

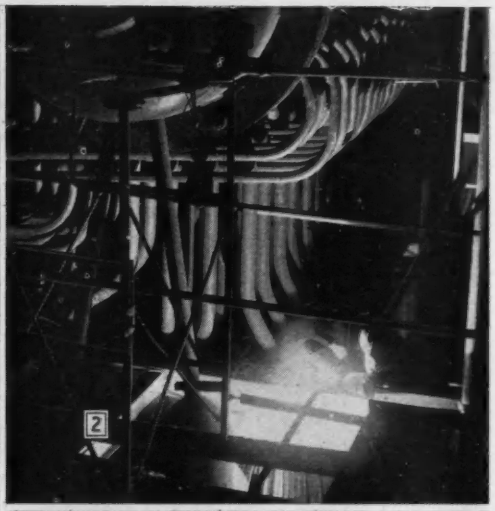
As already mentioned, five p.f. mills are provided for each boiler, and four of these can maintain the maximum boiler load with normal fuel supplies. Two "Sirocco" 127,000 cu ft/min f.d. fans driven by 270 b.h.p., 970 r.p.m., 6·6 kV, E.C.C. motors deliver air for both the boilers to the air heaters. The tubular non-regenerative air heaters are fitted with a remotely controlled by-pass for use at start-up and low loads. From the air heaters, the hot air passes via a remotely controlled outlet damper to the burner wind box. The primary air which is used to dry the coal in the pulverising mills and to carry the fine particles of coal to the burners, is drawn from either the air heater outlet or the cold air duct tapped into the air heater by-pass. The flow of primary air through the mills is used to control the amount of coal entering the mill.

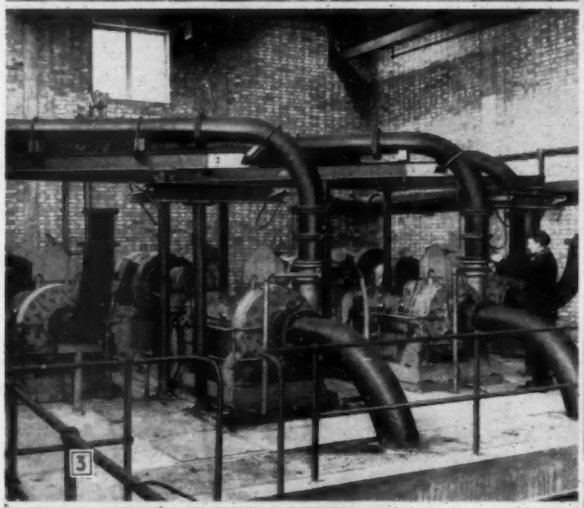
Gases from the furnaces pass out at the top of the boiler via a secondary superheater to the reheater/primary superheater box. The centre of the three main passes from which the gas flows contains the reheater and the two outer ones contain the primary superheater. The gas is then passed into the economiser which is of the continuous loop type with a single by-pass duct. From the economiser the gas flow divides into two ducts which pass beneath the boiler to the air heaters via remotely controlled inlet dampers. The air heaters are the last heat exchanging part of the draught system and from them the gases go into the dust removal plant which is divided into two sections.

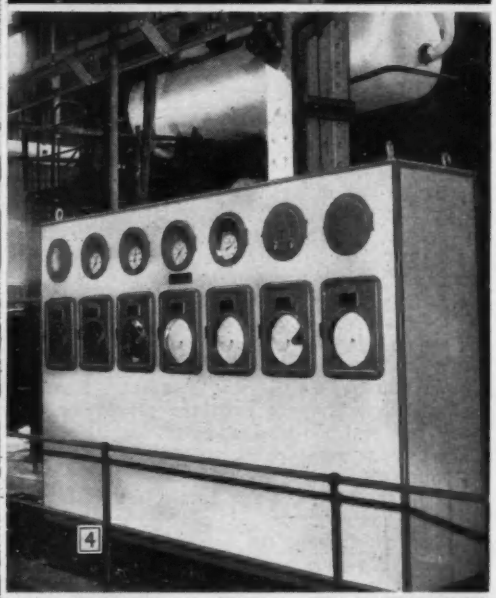
Dust Extraction

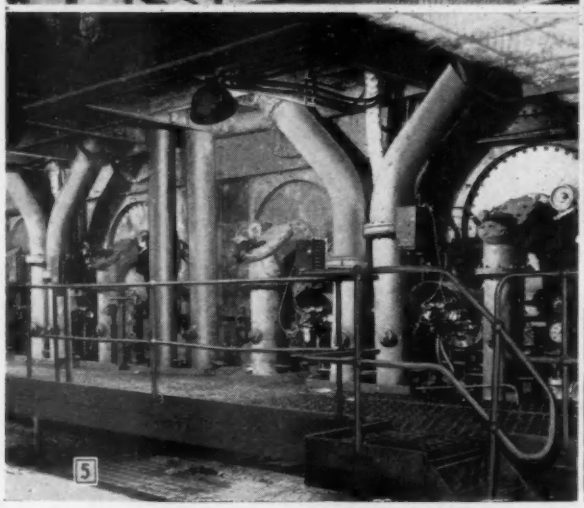
In the first section the larger particles are removed by mechanical means. These mechanical dust removers consist of 120 small cells mounted between two plates. Each cell consists of a short circular tube containing a stationary fan followed by a second tube of slightly smaller diameter. As the gases pass through the cell a spiral motion is imparted to them by the fixed fan

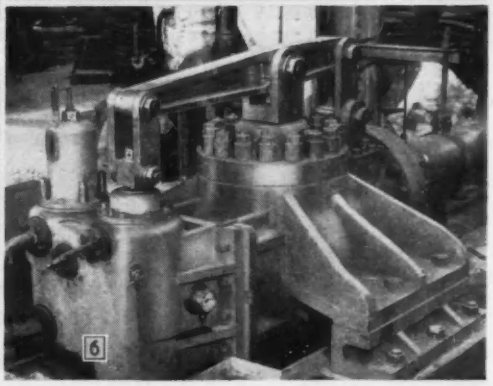




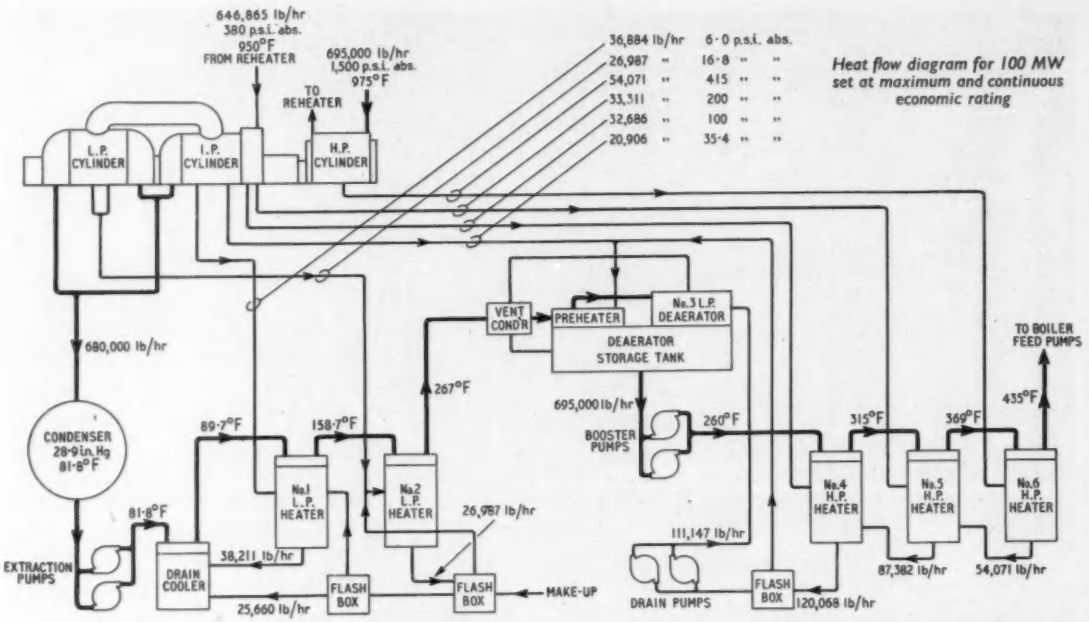








1. *Boiler drum.* **2.** *Boiler construction.* **3.** *Ash pumps.* **4.** *Bailey Meters transmitter panel for boiler control.* **5.** *Boiler burners.* **6.** *Unloading valve*



and the heavy particles of gas are thrown outwards and fall out between the first and second tubes. In the second section of the dust removal plant a Lodge Cottrell electrostatic precipitator removes the fine dust. Gases from the precipitators are exhausted by means of two 217,000 cu ft/min i.d. fans, each driven by two motors, one developing 406 b.h.p. at 585 r.p.m. and the other 770 b.h.p. at 735 r.p.m. Both motors are supplied at 6·6 kV and were made by the Electric Construction Co. Each boiler has 48 electrically-operated soot blowers arranged for automatic sequence control. The soot blowers can also be operated manually. Steam at full boiler pressure (tapped from the primary superheater outlet box at 1,600 p.s.i. and 826 deg F) is used and the reduced pressures of the various blowers are obtained by orifice plates. Of the 48 soot blowers there are 24 Babcock & Wilcox single-nozzle retractable pattern blowers for cleaning the side and rear walls and 24 rack blowers for cleaning the superheater and economiser sections. Provision has been made for 20 similar soot blowers if required. The boiler feed pump discharges into the common main. There are two connections going to the economiser inlet box through isolating valves.

From the economiser steaming tubes water flows into the drum and leaves the drum through downcomer tubes into two top horizontal downcomer manifolds, and thence down to the two front wall boxes and one rear wall box extending the length of the boiler wall. The front and rear wall tubes take the water upwards direct to the drum and the side walls return it to the two top side wall header boxes and then to the drum via riser tubes. The saturated steam from the drum is fed through the radiant superheater which is of the inverted pendant type situated at the top of the combustion chamber adjacent to the rear wall. The inlet and outlet boxes are situated immediately under each other approximately a third of the way down the rear wall. From the outlet box the steam is fed to the primary superheater enclosure and then via the primary superheater convection banks and the secondary superheater to the common outlet header. There is a stop valve at each end of the outlet header through which steam passes to the h.p. cylinder of the turbine. The turbine h.p. cylinder exhausts steam to the reheater section of the boiler where it passes through the horizontal and pendant sections and is discharged through the outlet manifold to the turbine i.p. cylinder.

Generating Plant

Three 100 MW, 3,000 r.p.m. C. A. Parsons turbo-alternators, each complete with its own condensing and feed heating plant, are being installed. The turbines are of three-cylinder design and with the exception of a two-row velocity wheel on the h.p. shaft they are fitted with reaction blading throughout. There are ten reaction stages as well as two impulse stages in the h.p. cylinder. After passing through the h.p. cylinder steam returns to the boiler for reheating before entering the i.p. cylinder. About two-thirds of the exhaust from the i.p. cylinder after 17 stages of expansion is transferred by an overhead pipe to the centre belt of the balanced double-exhaust l.p. cylinder. The balance passes through 11 more stages in the i.p. casing to the condenser.

The two-flow l.p. cylinder has eight stages in each flow. The stop valve steam conditions of the turbine are 1,500 p.s.i. and 975 deg F. Steam is reheated to 955 deg F at 432 p.s.i. The h.p. rotor has an adjustable thrust bearing by means of which the blading clearance can be increased during starting up. The i.p. thrust bearing is fixed and the h.p. and l.p. rotors are connected by a sliding coupling. The couplings between the l.p. and i.p. and alternator rotors are solid, the l.p. thrust bearing locating all three rotors.

The blading of the machine is novel in that there are three exhaust outlets to the single regenerative condenser. As already mentioned, there is an l.p. section incorporated in the i.p. turbine in addition to the normal double-flow l.p. turbine. The steam flowing through the blading in the reaction turbine exerts considerable pressure on the moving blades in the direction of its flow. To resist this pressure dummy pistons are attached to the inlet end of the rotor against which the inlet steam

pressure exerts a counterbalancing thrust on the blading. There is one dummy piston on the h.p. spindle and two on the i.p. The double-flow l.p. turbine is, of course, self-balancing.

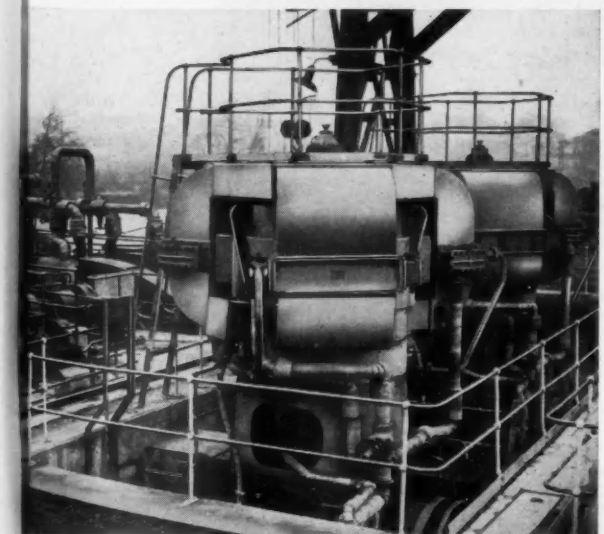
The main oil pump is directly driven from the turbine shaft via gearing and is divided into three separate pumps, power oil, pilot and seal oil and lubrication. The power pump discharges at 100 p.s.i. and supplies oil for the operation of the power pistons of the emergency stop valve, governing valves, interceptor valves and unloading valves. The pilot and seal oil pump discharges at 70 p.s.i. and supplies oil for the control of the main governing valves and oil for the hydrogen seals. The lubrication pump discharges at 20 p.s.i. into the common lubricating oil line which is provided with a relief valve which opens to drain to the main oil tank at a pre-set figure. An a.c. motor driven auxiliary oil pump provides all main oil pump services and is used when the turbine is not running at speed. An automatic cut-in feature is provided to start the auxiliary pump when the main oil pump pressure falls. A d.c. motor driven emergency oil pump supplies the main bearings only and is provided with an automatic cut-in switch operated by oil pump pressure. An a.c. and a d.c. seal oil pumps are provided as well as an a.c. motor driven gear oil pump. There are three 50 per cent duty lubricating oil coolers and a Hopkinsons oil purifier.

The governing gear on these machines is operated solely by means of oil pressures. The control gear is complicated by the fact that the turbines operate on a reheat cycle. It is therefore necessary to include interceptor valves to prevent the flow of steam into the i.p. cylinder and as a further protection unloading valves are provided on the pipework from the reheater to release the steam contained within the reheater and pipework to atmosphere.

Steam for feed heating is bled from the turbine at six points. The first three stages are l.p. heaters, the third being a high-level de-aerator heater of the direct contact type. The last three stages are h.p. heaters. The final feed temperature at full load is 435 deg F.

From the three exhaust outlets steam passes into the condenser which has a total surface area of 75,000 sq ft.

Cooling water pumps at the intake



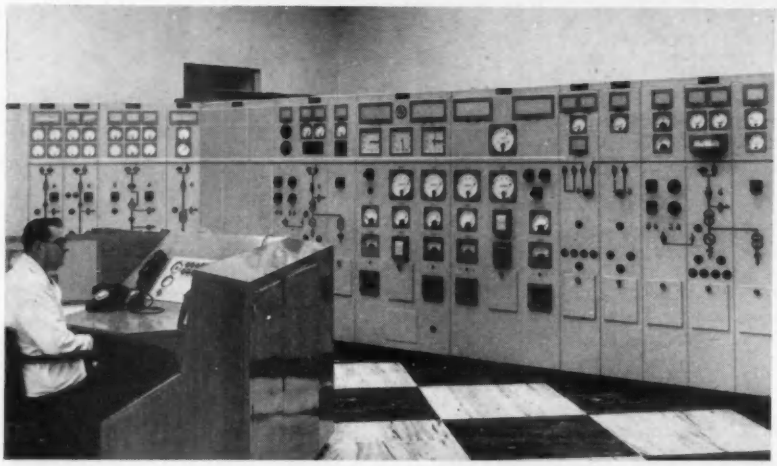
Plant control room

The condenser is designed to give a vacuum of 28·9in Hg at m.c.r. when it is supplied with 64,000 gal/min of cooling water at 60 deg F. Condensate is extracted from the condensers by two 100 per cent duty 680,000 lb/hr extraction pumps; air is removed from the condensers by three 50 per cent duty 227 lb/hr rotary Le Blanc type motor driven air pumps and a separate motor driven quick-start exhauster is also provided. The extraction pumps discharge through the l.p. heaters to the de-aerator storage tank which supplies the suction of the two 100 per cent duty Harland booster feed pumps supplied for each unit. The booster pumps, each of which is driven by a 800 h.p., 1,470 r.p.m., 6·6 kV water-cooled motor of Harland manufacture, are capable of delivering 850,000 lb/hr of water at 540 p.s.i. through the l.p. heaters to the suctions of the two 100 per cent duty Harland feed pumps. The feed pumps are driven by 2,650 h.p., 2,980 r.p.m., 6·6 kV water-cooled motors of Harland manufacture and are rated for 850,000 lb/hr of water at 1,960 p.s.i.

Each unit is provided with a Parsons double-effect bled steam evaporator capable of producing at m.c.r. 25,000 lb/hr of distillate for make-up. The raw water before being fed into the evaporators is treated by a Permutit hydrogen-ion blend plant which produces water softened to commercially zero hardness.

Cooling Water System

Cooling water for the condensers is obtained from the River Aire through a bar screen of 3in mesh and three balanced reel type rotary screens, each capable of dealing with seven million gallons of water per hour. Since there is not enough water in the River Aire to provide the full requirement of cooling water, three 3¾ million gal/hr cooling towers have been built by the Davenport Engineering Co. These are arranged between the c.w. inlet and outfall works in such a way that the water returned to the tower may pass either to the pump side of the c.w. screens or to the c.w. outfall, and so arranged that the c.w. intake can be flushed of all debris by means of the tower pumps. Three c.w. pumps are installed, each of which is driven by a 900 h.p., 6·6 kV motor and delivers 64,000 gal of water per minute. The pumps discharge into two 71in diameter pipes fitted with surge pipes and air releases. The c.w. inlet of the condenser is split into two halves by valves so that half the condenser can be



Electrical control room at Ferrybridge

isolated for on-load cleaning. After passing from the condenser, the c.w. discharges into two common ducts running the length of the station and thence into a pit by the cooling tower pumps. From this pit it can be discharged into the river direct or to the cooling towers.

Each alternator generates at 13·8 kV and is rated at 100 MW at 0·8 power factor when operating at a hydrogen pressure of 0·5 lb/sq in. The hydrogen cooling system is completely contained within the stator casing and four coolers run the full length of the casing. The cooling medium is distilled water. The distillate passes through three coolers through which circulating water is passed from the main culverts. The seal oil cooler is also supplied from the distilled water system. The excitation is provided from an exciter which is gear driven at 1,000 r.p.m. from the main shaft. The exciter cooling is provided by a separate enclosed air system, the circulation being by fans on the shaft.

Each unit is provided with automatic voltage regulators of the Metrovick normally inactive type, capable of keeping the generator terminal voltage within ± 1 per cent of the controlled value over the whole load range of the generator.

Alternators 1 and 2 are directly connected to 120 MVA, 13·8/132 kV generator transformers. Alternator No. 3 is directly connected to a 120 MVA, 13·8/275 kV generator transformer which is directly connected by overhead line to Monk Fryston substation, where the machine will be switched. Each alternator has a 10 MVA unit transformer solidly connected to the generator terminals, and there are two 10 MVA, 132/6·6 kV station transformers supplying the station switchboards. For the l.v. auxiliaries, supplies are obtained from 6·6 kV unit and station boards via 6·6/0·433 kV auxiliary transformers which feed the various 415 V boards throughout the station. The 132 kV outdoor switching station accommodates thirteen 3,500 MVA oil circuit-breakers of British Thomson-Houston manufacture.

The design and construction of the station is being carried out by the C.E.G.B. Northern Project Office, with Messrs. Mott, Hay & Anderson as civil engineering consultants, and the architects are Messrs. Watson & Coates.

The main contractors are:—Civil engineering works, George Wimpey & Co., Ltd.; boilers, Stirling Boiler Co., Ltd., and Babcock & Wilcox, Ltd.; turbo-alternators, condensing and feed heating plant and generator transformers, C. A. Parsons & Co., Ltd.; coal handling plant, Mitchell Engineering, Ltd.; 132 kV switchgear, British Thomson-Houston Co., Ltd.; 6·6 kV switchgear, South Wales Switchgear, Ltd.; 415 V switchgear, Brookhirst Switchgear, Ltd., and English Electric Co., Ltd.

Acknowledgment is due to Mr. C. G. Richards, Divisional Controller, Yorkshire Division of the C.E.G.B., for permission to publish this article.

Position Control of Massive Objects

A COMPREHENSIVE treatment of the position control of massive objects, by a team of experts led by Professor A. Tustin, is being published in November in the form of a paper which, in effect, is a short textbook. Together with a supporting paper on dimensional relationships in control systems, by Professor Tustin, the main paper will appear as a supplement (No. 1) to Part C of the *Proceedings* of the Institution of Electrical Engineers. Applications for copies (8s 6d to members and 15s to non-members) should be addressed to the Secretary, Institution of Electrical Engineers, Savoy Place, W.C.2. The edition is limited, and there will be no reprints of the individual papers.

In the main paper, "The Design of Systems for Automatic Control of the Position of Massive Objects," the authors consider the particular class of automatic feedback control systems in which the purpose is to move a massive body in agreement with the variations of an input quantity, usually the angular displacement of a shaft. The power required for the movement of the load being far too great to be obtained direct from a thermionic amplifier, additional amplification is provided, for example, by magnetic or rotary amplifiers. The design of such systems is constrained by the need for limitation of torque and speed, and by many other considerations not taken into account in discussions of control systems in general.

By introducing the relationship between power amplification and the associated time-constants it has been possible to express the conditions for adequate damping in terms of power amplification and accuracy, together with simple functions which express the contribution made towards meeting the requirements in using up the limited amount of phase lag allowable.

In the supporting paper the essential theorems of dimensional analysis are reviewed and related to the familiar process of normalising or "non-dimensionising," by which the results of calculation or observation of relationships between varying quantities may be expressed so as to be applicable to many possible observations.

Consideration is also given to systems involving non-linear relationships, and in such cases the choice of the products having dimension zero, in terms of which results may most effectively be recorded, is particularly important and may be less obvious. A procedure is outlined, using the concepts of sets of related curves and representative values, by which the appropriate composite variables may be discovered.

Building Construction and Space Heating

Many examples are given of how to improve, during construction, the heat insulation of buildings which are to be equipped for continuous electric space heating. Different types of construction materials and methods of installing them are recommended. The meaning of "U" as a factor of thermal efficiency is explained and the values for different types of construction are given

By
R. I. ELLARBY,
A.M.I.E.E.

ALTHOUGH the cost of all forms of fuel for heating purposes is rising steadily, it is an inescapable fact that solid fuel costs are rising far more rapidly than electricity tariffs. The present price of coal is 45 per cent higher than in 1953, whereas the corresponding rise in electricity tariffs for domestic use is approximately 14 per cent. Where advantage can be taken of off-peak tariffs for space heating, the cost of electrical energy is now 13 per cent less than tariffs available for heating in 1953, thus giving a relative price increase for coal of 58 per cent more than for electric heating tariffs of this nature. It is not surprising, therefore, that the number of newly-built domestic and commercial buildings being equipped for electric space heating is growing rapidly, the majority of these installations being for off-peak operation.

The advantages of electric space heating, and the relative merits of the various systems available, are a subject in themselves and it is not proposed to dwell on them in this article. It is a fact, however, that the operational costs of any form of continuous space heating by electricity are proportional to the thermal efficiency of the building construction itself, and it is proposed to discuss the relative thermal insulation merits, and costs, of the more common types of construction available for this class of building. Various forms of construction differ considerably in their thermal efficiency, and the accepted standard basis for the comparison of this efficiency is known as the "U" value or factor. A structure having a high thermal efficiency has a low "U" value, denoting a low rate of "thermal transmittance" or heat loss, whereas a structure having poor insulating properties has a high "U" value, indicating a more rapid heat loss.

Calculation of "U" Value

Tables giving the various constants required for the calculation of the "U" value for any composite construction are found in handbooks available from several sources, and many of these books give full information on the methods of calculating the constants and the "U" value. The tables give "U" factors for various forms of construction, and also give "k" (thermal conductivity) values for materials which may be used in varying thicknesses. In addition, values are given for the thermal resistances for cavities, for internal and external surfaces, and for different degrees of exposure to climatic conditions.

"U" is defined as the "thermal transmittance" or heat leakage of a structure in terms of B.Th.U/sq ft of surface area, per hour, for every degree F difference between indoor and outdoor temperatures. It is the overall air-to-air resistance of the finished structure and it takes into account the various "k" factors and thicknesses of the materials involved, as well as the resistances of the surfaces and cavities.

"k" is defined as the "thermal conductivity" of the material and is the amount of heat transmitted through each inch of thickness in B.Th.U/sq ft/hr for each degree F difference in temperature between one side of the material and the other side, i.e. between faces. It does not take into account the surface resistances of the material.

Example 1.

The "U" factor is required for a standard 11in brick and cavity wall plastered on the inside.

Material	Conductivity k	Resistivity 1/k	Thick. inches L	Resistance L×1/k
Brickwork	8·0	0·125	2×4½	1·13
Plaster	3·3	0·3	⅝	0·19
Resistance of 2in cavity (sealed)				1·0
Resistance of external wall surface				0·3
Resistance of internal wall surface				0·7
			Total air-to-air resistance	3·32

$$\therefore \text{"U"} = 1/3{\cdot}32 = 0{\cdot}3$$

Now having found or calculated a "U" factor for a given construction, it may be necessary to calculate the difference caused by modifying a structure so as to improve its thermal efficiency.

Example 2.

The basic roof construction consisting of a pitched roof of tile or slate, on battens, on felt or building paper, with a ceiling of lath and plaster or plasterboard, has a "U" value of 0·43; this is modified by the addition of a 1in fibreglass quilt placed over the ceiling joists: what is the modified "U" and the reduction in heat loss?

"U" of roof and ceiling without quilt ..... 0·43

$\therefore$ air-to-air resistance without quilt $= 1/0{\cdot}43 = 2{\cdot}33$

Additional resistance due to quilt:—

Resistance of cavity between quilt and ceiling	1·00
Resistance of 1in quilt	4·00
Total air-to-air resistance	7·33

$\therefore$ the new "U" value is $1/7{\cdot}33 = 0{\cdot}14$, and the reduction in heat loss is about 67 per cent.

TABLE I.—THERMAL INSULATION AND COST DATA FOR BUILDING CONSTRUCTION

Type of Construction	Cost/yd	"U"
1. Walls		
(a) Traditional, 11in brick, ventilated cavity, plastered internally, rendered externally	62/–	0·34†
(b) As (a) but with sealed cavity	63/–	0·30
(c) As (b) but using high insulation block inner skin	65/–	0·20
(d) As (b) but having lining of ins. plaster brd. on bat.	70/–	0·18
(e) As (b) but with breeze blocks for inner skin	61/–	0·25
(f) As (b) but using hollow clay pots throughout	63/–	0·16*
2. Ceiling and roof		
(a) Tiles on battens on felt, with plastered ceiling	260/–	0·43†
(b) As (a) with boards under tiles	280/–	0·30
(c) As (a) with 1in fibreglass quilt over joists	263/–	0·14
(d) As (a) with loose fill between joists	265/–	0·15
(e) As (a) with both loose fill and fibreglass quilt	268/–	0·1*
(f) As (a) with ins. plaster brd. and fibreglass quilt	265/–	0·1
3. Floors		
(a) Suspended wood floor	30/6	0·4†
(b) Screed on concrete on hard core	17/6	0·2
(c) As (b) with 1in fibreglass below hard core	20/6	0·11
(d) As (c) with cork or wood floor finish	50/6	0·1*

* Alternatives marked thus are those recommended and for a typical small bungalow give an overall "U" of 0·21 compared with 0·46 for the more conventional alternatives marked †.

Note.—Cost/yd figures vary considerably according to district and size and type of building, and those given are based on the costs for a small bungalow in the district concerned and should be used only for purposes of comparison.

Standard of Insulation Required

For any form of heating, the present official recommendation is that the "thermal transmittance" or "U" value of roof, walls and floor shall not exceed "U"=0·2, but for any form of continuous heating, the leading authorities recommend that this figure should be improved upon. In America, the standard thermal transmittance for the ceilings and walls of electrically-heated houses, as laid down by the Federal Housing Administration, is "U"=0·1.

It is obvious, therefore, that to enable full advantage to be taken of the benefits of electric space heating, the highest standard of insulation economically justifiable should be used. This is especially important where some form of continuous heating such as thermostatically-controlled storage heaters or floor warming is concerned.

Insulating Materials

There are many forms of insulating material available for use in building construction, and the Structural Insulation Association will gladly give full details and advice concerning suitable materials or applications.

Many of these materials, such as loose fill or quilted wools and fibres, have been specially developed for their insulating qualities and must be used in conjunction with other structural materials capable of providing the required structural strength. Others, such as building blocks, slabs or aggregate, can perform the dual function of insulating and structural material at the same time.

Most insulating materials derive their properties from the multitude of small air spaces contained within them, and care must be taken to avoid the possibility of these spaces becoming full of water, as this will seriously impair their insulating qualities. Another type of insulating material, polished aluminium foil, derives its properties from its reflective nature and must therefore be used in conjunction with an air space.

Intelligent design of the various sections of a building can result in a fairly high overall standard of insulation at very little extra cost, especially if the more important sections, i.e. roof and other large areas, receive most attention (see Table 1).

Roof and Ceiling

These are taken together as the air space in between forms part of the insulation of the whole. The conventional pitched roof structure of tile or slate, on battens, on felt or building paper, with a ceiling of lath and plaster or plasterboard, has a "U" of 0·43, which is much too high in these days of expensive and scarce fuel, regardless of the form of heating used.

The usual way of improving this figure, at a very reasonable cost, is to install either a loose fill of cork, vermiculite or mineral wool, etc., between the ceiling joists, or else an insulating quilt of fibreglass, slag or rock wool over them. Either of these methods will improve the insulation value to "U"=0·15, and for traditionally heated buildings this is quite adequate.

For single-storey buildings, however, where the roof is the most important part of the structure so far as heat loss is concerned, some further improvement is desirable, and where continuous heating is concerned it is economically essential. This desired improvement can be achieved by the use of a combination of both the forms of insulation already mentioned, i.e. loose fill between the joists and a quilt over them, giving a "U" of 0·1. A possible saving in initial cost can be effected by using insulating plasterboard instead of the loose fill, this giving approximately the same "U" factor as the double method. It must be remembered, however, that the insulating plasterboard derives its insulating qualities from the heat reflecting properties of its polished aluminium surface and must be used in conjunction with an air space which, in the construction described, is formed with the quilt over the joists. The loose fill has the additional advantage of improving the acoustics of the building by absorbing ceiling vibrations.

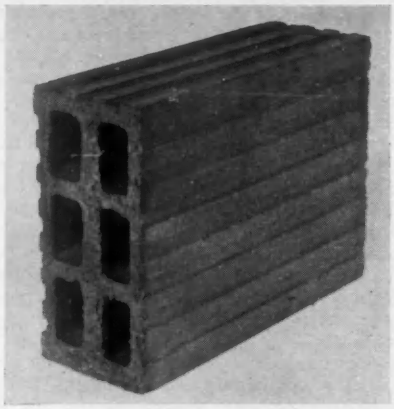
Further advantages of good insulation are the obvious reduction of condensation, and also of solar heat penetration of the roof and ceiling during high summer, both important considerations so far as comfort is concerned, especially in single-storey buildings.

Walls

It is common practice to-day to build external walls consisting of two skins or leaves of brick or building block separated by a 2in cavity. This type of wall has a much better "U" factor than the solid wall, due to the cavity. Sealing this cavity will effect about a 10 per cent reduction in heat losses, but this is by no means a standard practice. In some quarters, particularly of the old school, it is thought that sealed cavities may result in damp walls. This belief has never been substantiated and any dampness may well have been caused by the cavities becoming bridged due to accident or to carelessness. In such cases, it is obvious that excessive cavity ventilation will tend to reduce the dampness, but in the author's opinion this is bad practice as it removes the symptom rather than the cause, at the expense of the thermal insulation.

If it is intended to seal the cavity, a necessary precaution if maximum heat insulation is required, then special care should be taken at windows, particularly the sills, to ensure that there is no crevice through which wind can blow into the cavity. Quite often window frames are merely rested on the back edge or lip of the sill. Another weak point is where the wall rises to the wall-plate immediately beneath the roof and ceiling joists where the cavity is normally left open. Air bricks and ventilators often do not bridge the cavity, but are merely grills piercing each wall leaf thus increasing the cavity ventilation to the point where, on an exposed wall, the air in the cavity is at outside temperature giving, in effect, single brick wall insulation.

With the normal form of construction outlined above, even with high-insulation blocks and sealed cavities, the thermal efficiency cannot be higher than "U"=0·2, which is the minimum standard of insulation recom-



Twelve-inch hollow clay building block

mended for traditionally heated dwellings in Britain. For dwellings having continuous heating, especially of the storage type, some improvement on this figure is economically essential. The usual method of effecting this improvement is the rather expensive practice of lining the internal face of the wall with wood wool slabs or, more simply, with insulating plasterboard on battens. This gives a "U" factor of from 0·15 to 0·18, but the cost of this can rarely be justified, at least for private dwellings. The multi-cell, hollow clay block is much less commonly used than either brick or solid building blocks, but while costing no more than brick walling, it can provide a fair degree of insulation, having a "U" value of 0·16. This block can be used for all normal walls, including internal walls. Further advantages of this block are:—

(a) That due to the large internal air cells, it should retain its insulating properties under damp conditions to a far greater extent than materials relying on very small air pockets which can easily retain moisture, and

(b) It should absorb far less water during building operations than any of the solid blocks or bricks, and it is obvious, therefore, that the drying-out period should be much reduced.

A newer method of achieving highly efficient thermal insulation in wall construction is to fill the 2in cavity with fibreglass. This can provide a construction having a "U" factor of 0·1 or better, at a very reasonable cost. It must be noted, however, that this form of construction is purely experimental and is not yet recommended for general adoption by any authority. On the contrary, qualified architects and civil engineers in general advise against it because of the serious risk of internal dampness due to the bridging of the cavity on exposed walls, but where the wall is protected from the weather it could be used with advantage. It may also be possible to use this form of insulation in conjunction with hollow clay blocks as the air cells in the blocks would form a barrier to much of the external dampness; in very exposed situations, however, driving rain could still cause trouble.

Windows

Windows are the chief drawback to a high degree of overall insulation in the modern building. They cause a rapid heat loss even when double glazing is used. Single-glazed windows have a "U" factor of 1·0, compared with 0·5 for double glazing. There is little hope, therefore, of achieving an overall "U" value for the whole building of much less than 0·2, while the windows themselves have a "U" factor of 1·0, and where double glazing cannot be justified consideration should be given to the use of internal window units to provide semi-sealed double glazing. These internal units could consist of glazed moulded plastic or wooden frames clamped inside the main frames and semi-sealed by means of felt strips, leaving about ¾in as an air space. This would improve the thermal efficiency to about "U"=0·7. In addition, the internal units will reduce condensation and draughts.

The use of heavy curtains and fitted box pelmets having a closed top will reduce chimney effects between the curtain and the window, and will effect a worthwhile improvement of the "U" factor to about 0·8.

Floors

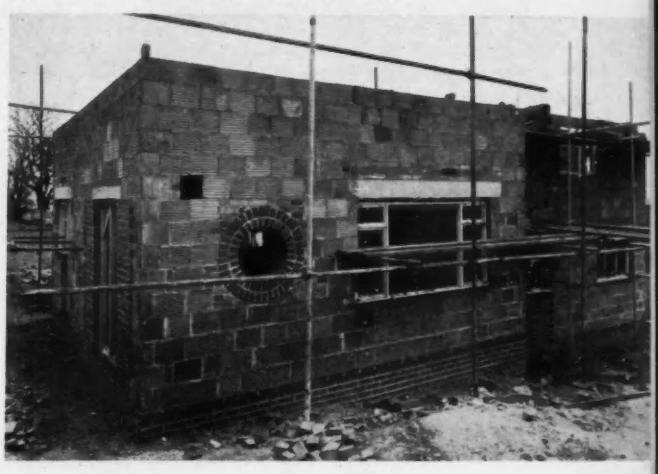
Before the war the majority of new houses were built with boarded ground floors suspended over ventilated under-floor spaces. Now the tendency is to have solid concrete floors with some form of tile, block or sheet finish.

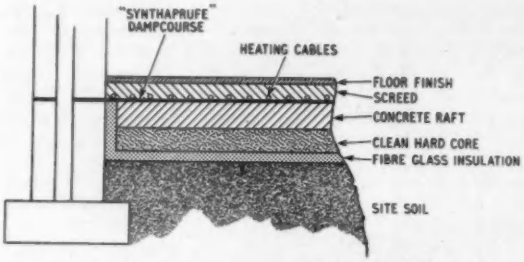
The "U" factor for the solid floor is about 0·2 compared with about 0·4 for the suspended floor, thus reducing the heat loss to one half.

This can be still further improved, at a reasonable cost, by installing 1in bitumen-bonded fibreglass quilting immediately below or above the hard core. This, together with a cork tile or wood block finish, will reduce the "U" value to about 0·1, giving a heat loss of only 25 per cent of that for the suspended wood floor, and the cost for the finished floor should compare very favourably with that for the finished wood floor. Such construction may not be thought necessary for close-carpeted traditionally heated dwellings, but for the contemporary bare or semi-bare floor, such insulation is very desirable to avoid the "cold-floor" sensation.

Where floor-warming systems are concerned, especially when these operate on an off-peak tariff as a thermal storage system, the additional insulation beneath the floor slab is very desirable and is economically worth while. In addition, some form of edge insulation for the floor slab is essential, as the edge losses can amount to as much as 25 or even 30 per cent of the total heat input. To provide both these forms of insulation in the simplest and cheapest way, 1in bitumen-bonded fibreglass quilting

Typical hollow clay block construction, showing use of special corner blocks to close block air cell





Section of floor slab showing heat insulation construction and cable positions

may be placed below the hard core, with the edges of the quilt turned up vertically between the edge of the composite floor slab and the wall foundations, so as to form a heat barrier. The hard core itself should preferably be large and clean; 2in clean stone is ideal, and it should not be filled in with dust, rubbish or ashes, as air spaces reduce any tendency towards water lift or rising damp. In addition, air spaces improve the insulation value and if the stone is too coarse to carry the concrete without too much downward filtration, clean chipping should be used as a filling material for the surface of the hard core. The final " U " value for this type of floor is 0·1 or better.

Floor Finishes

Floor finishes and coverings are used to improve both the appearance and comfort, and on unheated solid floors any of the conventional finishes, particularly those having high thermal insulating properties, can be used with advantage.

On heated floors, however, the covering or finish acts as a barrier to the heat dissipation from the floor. The effect then, is that the temperature of the floor slab rises until the surface of the finish attains the same temperature as the former bare concrete surface. As the temperature drop across the finish can be up to about 10 deg F, the temperature of the whole slab can also be raised by this amount, resulting in increased downwards and edge losses.

It follows, therefore, that for floor-warming installations, to obtain maximum economy, the surface of the floor slab should be as lightly insulated as possible, and any carpets should preferably be small and should be placed away from outside walls so as to avoid any unnecessary increase in the temperature of the slab at the edges.

Fireplace and Chimney

Although an all-electric dwelling requires no chimney or fireplace, it is often preferred to include a conventional chimney and flue for architectural and possible re-sale value reasons, and fireplaces may be required to provide focal interest in the rooms themselves.

If required, the chimney and flue may be formed in the usual way with the flue partially sealed both top and bottom, the bottom or fireplace soffit being fitted with an adjustable ventilator control so that the chimney can be used as a room ventilator as required.

The fireplace may be designed to accommodate a log basket or a log or coal effect fire, thus combining focal interest with the provision of additional heat as and when required.

To keep heat losses to the minimum, a compact plan having a minimum of outside walling is desirable. Living rooms, which are normally kept at a higher temperature than the remainder of the house, should preferably face south or west, or should be protected from cold prevailing winds. Windows facing north or east should be of modest size because of the extremely high rate of heat loss in comparison with the normal wall structure.

Finally, although this article merely endeavours to illustrate how dwellings and similar type buildings can have efficient thermal insulation at low cost, it must be remembered that with any form of electric space heating, reduced heat losses mean reduced loadings for the heating equipment, and any increased cost of building due to these methods of thermal insulation can easily be offset by the possible saving in heating equipment capital costs. The economy in running costs thus achieved remains to be enjoyed as one of the many advantages of all-electric space heating.

Thanks are due to Mr. G. E. Scoble, of Blight & Scoble, Ltd., building contractors, Buckfastleigh, Devon, for general information and advice, and to the Western Counties Brick Co., Ltd., Exeter, for supplying illustrations and other information.

Note.—The following publications will be found to be useful by anyone interested in the thermal insulation of buildings :—

(1) " Thermal Insulation of Buildings," by Nash, Comrie and Broughton. H.M. Stationery Office.
(2) " The Computation of Heat Requirements for Buildings." Institution of Heating and Ventilating Engineers.
(3) " How to Insulate Buildings." Structural Insulation Association.

Post Office Mechanisation

AT an open day for industrialists and business men, held last week at the G.P.O. in London, the Postmaster General, Mr. Ernest Marples, outlined plans for the postal services. A closed circuit television link from Southampton sorting office was used to illustrate Mr. Marples' description of some new automatic machines.

Mr. Marples said that present-day methods of handling mails were the same as those in use a hundred years ago. Wages accounted for 70 per cent of the costs so that reduction in staff by mechanisation was essential for economic operation of the service. Sorting operations cost £40 million per annum.

The first stage in the mechanisation of the postal services involves a number of new sorting machines developed by the Post Office. Letters and packets are first segregated in a tilted rotating drum. The letters are then mechanically separated into sizes and, on the automatic letter facing and cancelling machine (ALF), are correctly positioned for stamp cancelling. This machine operates by electrically detecting the position of the stamp on the envelope. Special stamps, with graphite lines printed on the back, are already being sold for this purpose. The cancelled letters are then sorted in the electronic letter sorting and indicating equipment (ELSIE) which is operated by one man and can sort 3,000 letters per hour. These machines, of which twenty are now on order, were described in the *Electrical Review* of 12th September. A mechanical parcel sorter will be used at Leeds next year.

The next stage in the mechanisation of the Post Office is to reduce the number of different sizes of envelopes to one or two standard sizes and to code the address so that letter sorting can be carried out automatically. Coding will be carried out at the collection Post Office by means of dots printed on the envelope and visible in ultra-violet light. A Gallup poll is at present being carried out to determine how far the public will help the Post Office in the matter of coding addresses. The results should be available in a few months' time, when a trial town will be selected for operating this system. The coding will identify any postal round in Britain and when this is in operation the electronic letter sorter will be replaced by a completely automatic system.

VIEWS on the NEWS

By REFLECTOR

METHODS of enabling consumers to meet their quarterly electricity bills without undue hardship are always in the minds of the Electricity Boards. The most effective seems to have been the stamp system introduced by the North Western Board. Now I see that the Irish Electricity Supply Board is supplying boxes in which consumers can amass the necessary amount by regular contributions. This seems to me to be "wet nursing" the consumers. Why cannot they provide their own boxes? If the answer is that there is no guarantee that the money would stay in the boxes surely the same applies to those "officially" provided. The Board could hardly take action against those who forced open the boxes to recover their contributions.

* * *

American delegates to the Geneva "Atoms for Peace" conference spoke of the possibility of employing nuclear fusion energy for underground excavations. It was suggested that by this means it might be found that many countries of the world had oil deposits which could thus be made available for use. But surely if this were proceeded with those countries would find it unnecessary to look toward controlled nuclear power for their development and much that is being done now in the nuclear way would be found to be premature.

* * *

From South Africa comes another item for my series of electrical fish stories. It concerns new electronic shark barriers proposed for the Natal South Coast. The proposal is to lay three cables attached to electrodes on the sea bed to form an enclosure. According to the official story:—

> "Two of the cables would be parallel, one positive and the other negative. The third—negative—would be laid at the water's edge. A 40 to 50 volt current would be passed between the first two creating a field of about 1·5 volts—enough to repel sharks but only giving a tickling sensation to bathers stepping on the cables. An automatic device would be attached to the cables to warn bathers of any power failure."

* * *

Fresh thinking on the subject of river "pollution" by power stations characterised a paper by Dr. H. B. M. Hynes of Liverpool presented last week at a symposium arranged by the Institute of Biology. Hitherto, the complaint has been that the raising of the temperature of river water has led to the excessive growth of weeds and to harmful effects upon fish. Dr. Hynes suggested that the higher temperatures should be used to create "little sub-tropical parks in the middle of nowhere," this being done by introducing game, fish and plants from sub-tropical regions into the affected rivers. Some of the speakers in the subsequent discussion did not think much of this suggestion, but one of them, Mr. W. B. Yapp, a Birmingham zoologist, thought that the co-operation of the Central Electricity Generating Board might be sought in the matter.

* * *

A correspondent of the *Manchester Guardian* has written of the mingled regret and satisfaction in Glasgow at the Corporation's decision to abandon its trams. He puts forward the usual pros and cons of the tramway controversy and concludes by saying:—

> "The sentimentally inclined Briton will soon have to go to Hamburg, Brussels, Oslo, Stockholm, Boston, or Philadelphia for a ride on a tram. Some American cities—Cleveland, for instance—having abandoned conventional trams some time ago, have now made a return to a more substantial type of electrically operated vehicle on rails. Why do these old-fashioned Americans not learn from the lessons of London, Manchester, Edinburgh, and Glasgow? Well, it seems that if a city does not have trams, people use cars, which cause congestion. City officials look around for a solution, hoping to hit upon a mode of transport which will not get snared up in other traffic. Rejecting the idea of helicopters, their eyes light up when someone mentions electric-railed traction. Ah, that might be just the thing."

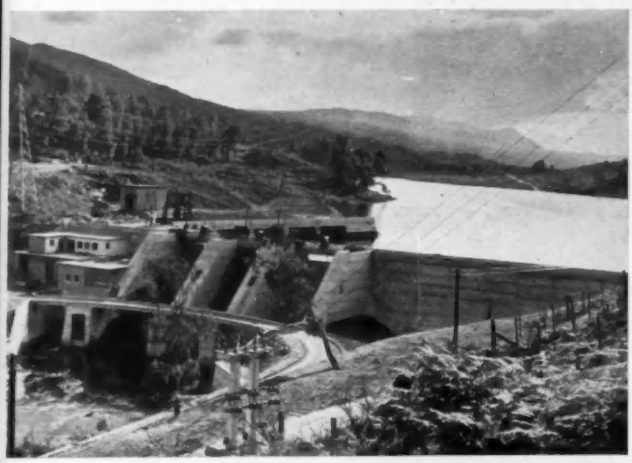
The reference to "electric-railed traction" probably means the use of separate high-speed tracks of the type used in Birmingham for some years.

* * *

Even seventy years ago the *Electrical Review* was able to say that "of all the sciences there is none which has been of more vigorous and rapid development than electricity." In its leading article of 1st October, 1878, from which this is quoted the *Review* went on to speculate on the future when "perhaps the electro-motor will worthily replace the superannuated steam engine." Electric lighting was already a formidable rival of gas lighting for "large works and public squares." The article concluded:—

> "We have seen during these latter years how magnetism, heat and sound can be transported into space by the electric current. In the future, near or remote, it will in all likelihood wing the shafts of light; as men now hear by telegraph, so will they see. Nerve force is surely a form of physical energy too; and with the fair prospect which we have before us, it is hardly too daring an imagination to anticipate the time when sensation itself may be transformed into electricity, and pain and pleasure sent by wire."

Presumably pain would be sent by wire to an enemy, as once pins were stuck into wax effigies of those to whom ill was wished.



Dundreggan Dam, part of the North of Scotland Hydro-Electric Board's Glen Moriston scheme

MORISTON SCHEME

Official Opening of 52 MW Hydro-Electric Project

THE Moriston hydro-electric scheme of the North of Scotland Hydro-Electric Board was officially opened last Saturday when Sir Christopher Hinton, chairman of the Central Electricity Generating Board, started up the Glen Moriston power station.

The scheme comprises two major underground power stations, Glen Moriston with two 16 MW vertical Francis turbines and Ceannacroc with one 16 MW and one 4 MW vertical Francis turbines. There are three other small power stations in the scheme which has a total catchment area of 155·1 square miles. The water impounded in Loyne reservoir passes through the auxiliary power station at Loyne, which has a vertical Kaplan machine with a 550 kW induction generator, and thence through a tunnel into the new Cluanie reservoir. The small compensation-water power station at Cluanie dam has a single 300 kW horizontal Francis machine. A tunnel from Cluanie reservoir carries the water to Ceannacroc underground power station and thence to the River Moriston. From the dam at Dundreggan the compensation-water passes through a 150 kW vertical propeller turbine. Glen Moriston intake is also at Dundreggan and the tailrace is at Invermoriston on Loch Ness.

The designed head of Ceannacroc is about 250ft and that of Glen Moriston is about 280ft. The annual electrical production of the scheme is expected to be about 216 million kWh.

All main generating sets at Ceannacroc and Moriston are arranged for push button automatic start and stop with manual synchronising but provision has been made for future addition of automatic synchronising and remote control by power line carrier equipment from the group control centre at Fort Augustus which is connected by a single circuit 132 kV line with the stations in the Glen Moriston scheme.

The mechanical and electrical consultant engineers are Messrs. Kennedy & Donkin, the civil engineering consultants are Sir William Halcrow & Partners and the architect is Mr. Robert Hurd, B.A.

The main contractors are:—Civil engineering works, Mitchell Construction Co., Ltd., and Duncan Logan (Contractors), Ltd.; the 4 MW machine at Ceannacroc, Harland Engineering Co., Ltd., and the 16 MW machine, English Electric Co., Ltd.; both machines at Glen Moriston, English Electric Co., Ltd.; the turbines at Dundreggan and Loyne, Boving & Co., Ltd.; the alternator at Dundreggan, Bruce Peebles & Co., Ltd.; the alternator at Loyne, English Electric Co., Ltd.; the turbine at Cluanie, Armfield Hydraulic Engineering Co., Ltd., and the alternator, Bruce Peebles & Co., Ltd.

B.S.I. Annual Report

THE many benefits which are available to industry through standardisation and simplification are emphasised in the report of the British Standards Institution for the twelve months ended 31st March last (price 7s 6d from the Institution at British Standards House, 2, Park Lane, W.1).

It is stated that the year was one of consolidation and, as was forecast last year, every practicable economy was required to redress the financial balance and to meet the additional strains imposed on the budget by increasing work and rising costs. Despite this, steady progress was made. As usual there was a heavy programme of international work, with special attention given by the expert panel to the problems likely to be raised by the development of a European Free Trade Area.

The year's standards and codes of practice (291) showed a small increase over the preceding year. Sales were just under the million mark. The number of subscribing members is now nearly 10,000, which represents an increase of 10 per cent during the year. A considerable number of existing members agreed to pay increased subscriptions. The number of those licensed to use B.S.I. certification marks increased during the year by 51, the total now standing at 1,399. About half a dozen new industrial electrical products have been added to those for which a "Kite-mark" is already being used. The mark is now being used for the first time under the following standards: mains operated electric fence controllers, smoke alarms, smoke density indicators and recorders, and ballasts for fluorescent lamps.

When he reviewed the report at the annual general meeting last week, the retiring president, Sir Herbert Manzoni, referred to the enlarged scope and importance of international collaboration on standards and the increase in public recognition of the Institution's work. Sir Herbert noted the evident intention of newly developing countries, in adopting national standards, to follow closely the recommendations of the I.S.O. and the International Electrotechnical Commission. The need for strong and effective participation by the United Kingdom in drafting these recommendations had recently been emphasised by the B.S.I. export panel.

Mr. R. E. Huffam, co-ordinating director of Unilever, Ltd., and chairman of the B.S.I. Finance Committee since 1952, was elected as the Institution's new president. He was recently also elected chairman of the General Council. He is succeeded as chairman of the Finance Committee by the Hon. Geoffrey Cunliffe, deputy chairman and managing director of the main companies in the British Aluminium Group, who has been a member of that Committee since 1952.

The two immediate past-presidents, Sir Herbert Manzoni and Sir Roger Duncalfe, were elected deputy presidents of the Institution, and Mr. John Ryan (vice-chairman of the Metal Box Co., Ltd.) was re-elected to this office. The appointment by the General Council of a new chairman of the Council for Codes of Practice was announced. He is Mr. A. C. Hartley, who succeeds Sir Allan Quartermain. The chairmen of the four Divisional Councils continue in office.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

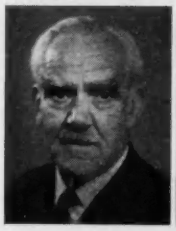
The Minister of Power has appointed **Sir Alexander Fleck,** K.B.E., F.R.S., D.Sc. (chairman of Imperial Chemical Industries, Ltd.), to be chairman of his Scientific Advisory Council.

Mr. W. M. Bishop, B.Sc.(Eng.), A.M.I.E.E., A.M.I.Mech.E., manager of the Hemel Hempstead District of the Eastern Electricity Board, has been appointed commercial officer of the Chilterns Sub-Area in succession to **Mr. F. C. Orchard,** who is the manager-designate of the Fens Sub-Area. Mr. Bishop was educated at Portsmouth Grammar School and at King's College, London University, where he graduated B.Sc.(Eng.). While at the University he became a student apprentice with the British Thomson-Houston Co., Ltd., following which he became assistant consumers' engineer at Portsmouth, and he subsequently held positions there until 1941 when he became the assistant mains engineer to the Bedford Corporation; he was appointed senior mains engineer in 1944. In 1945 Mr. Bishop went to Hoylake U.D.C. Electricity Department as mains superintendent and in 1947 was appointed deputy city electrical engineer and manager to the Exeter Corporation and remained on nationalisation of the industry as deputy senior executive officer. In 1950 he was appointed manager of the newly created Hemel Hempstead District of the Eastern Electricity Board.

Mr. W. M. Bishop

Mr. C. A. Stephens, director and overseas manager of A. Reyrolle & Co., Ltd., will retire from his executive duties on 20th October but will remain on the board. He joined Reyrolle's in 1922 after a period with J. H. Holmes & Co., and service with the Tyne Electrical Engineers and Royal Naval Division from 1914 to 1918. He was originally attached to the sales staff at Hebburn and was responsible for part of the Midlands area. In 1926 he transferred to the company's overseas division and assisted the late Mr. H. W. Clothier in building up the Reyrolle organisation throughout the world, including the establishment of associates in various countries for the manufacture of Reyrolle switchgear. This work involved many overseas tours, and Mr. Stephens was appointed overseas manager in 1937. During the last war Mr. Stephens was responsible for all the contracts handled by the company for war products and he was appointed to the board in 1944. He is also a director of the Parolle Electrical Plant Co., Ltd., J. H. Holmes & Co., Ltd., the British Short-Circuit Testing Station, Ltd., A. Reyrolle & Co. (S.A.) (Pty.), Ltd., A. Reyrolle & Co. (Rhodesia), Ltd., and Ets Merlin & Gerin.

Mr. W. G. Martin, T.D., at present deputy overseas manager, will succeed Mr. Stephens as overseas manager. Mr. Martin joined the company in 1926 and assisted his father, the late Mr. D. Martin, who was the company's representative in Scotland. In the last war he served in the Cameronians and Royal Artillery, attaining the rank of lieutenant-colonel. On his return from war service in 1945 he was appointed Scottish manager. He returned to Hebburn in 1956 to assume the post of deputy overseas manager and has already visited a number of the Reyrolle offices overseas.



Mr. C. A. Stephens

Mr. W. G. Martin

Mr. W. M. Brown, Bridlington district manager of the No. 6 (Hull) Sub-Area of the Yorkshire Electricity Board, recently completed fifty years' service with the Board and the former Bridlington electricity undertaking and he has been presented with a long-service certificate together with a refrigerator by Mr. D. Bellamy, chairman of the Y.E.B. The ceremony took place at the Bridlington Town Hall, and was attended by the Mayor of Bridlington (Alderman O. W. Clapp, J.P.), the town clerk and other chief officials and old municipal colleagues, in addition to the sub-area manager (Mr. C. Cameron Kirby), chief officers and members of the Board's staff and personal friends. Mr. Brown will be retiring on 1st January next.

Mr. C. Dykes-Brown, manager of the Illuminating Engineering Division of the General Electric Co., Ltd., left London last week for Johannesburg for a five-week tour of G.E.C. branches in South Africa. His visit will be primarily concerned with advising on contracts and inquiries for lighting which the company is at present dealing with in the Union. He was to lecture this week on modern lighting practice in Great Britain to the Annual Congress of Architects in Bloemfontein.

Mr. J. Foden, Associate I.E.E., transmission engineer, North West, Merseyside and North Wales Division of the C.E.G.B., retired on 30th September after fifty years in the electrical industry, of which twenty-one were spent on the manufacturing side and twenty-nine in electricity supply. Mr. Foden served his apprenticeship with Ferranti, Ltd., after which he joined the British Westinghouse Co., and remained with that company until 1915 when he joined Ferguson, Pailin, Ltd. He later held the positions of contracts manager, sales manager and production manager. In 1930 he joined the Central Electricity Board as frequency change engineer, and was particularly concerned with the 40 to 50 c/s changeover in the Stalybridge, Hyde, Mossley and Dukinfield area. He later became senior assistant transmission engineer

Mr. W. M. Brown (right) who has completed fifty years' electrical service at Bridlington, with Mr. T. E. Mott (former senior clerk) and Capt. A. J. Beckett (former borough electrical engineer)

for the Central Electricity Board, North Western England Area, and on vesting day was appointed transmission engineer, North Western Division of the B.E.A. He retained this position on the formation of the N.W., Merseyside and North Wales Division.

Dr. E. C. Cherry has had the title of Henry Mark Pease (Standard) Professor of Telecommunications conferred on him in respect of his post at the Imperial College of Science and Technology.

Edward Holme & Co. (1931), Ltd., have appointed **Mr. J. M. H. Berry** as chief engineer and **Mr. M. M. Westmorland** as sales manager.

Mr. R. I. Ellarby, A.M.I.E.E., who writes on "Building Construction and Space Heating" (page 611), served an electrical apprenticeship with J. Preston & Sons, Fleetwood, from 1933 to 1939. His war service, in the Army, was with the mobile workshops. In 1942 he joined the Alkali Division of I.C.I., Ltd., and worked on the repair and recalibration of all types of electrical instruments. After a full-time Higher National Certificate course at Wigan Mining College, he returned to I.C.I. and was engaged on the design and development of special instruments and test apparatus, becoming assistant technical officer in charge of the meter test section in 1949. From 1950 to early this year he was assistant technical officer to the head of the electrical research and development section, working on such diverse investigations as system fault and loading conditions and devising special optical, pneumatic and electric techniques for revealing small machining or assembly inaccuracies.

Mr. R. I. Ellarby

Mr. A. C. Stewart and **Mr. P. W. Robinson,** A.M.I.E.E., have been appointed assistant sales managers of Westool, Ltd. Mr. Stewart will be handling coils, solenoids, fans, motors, rotary transformers and transformers. He joined Westool in 1955 after serving with the R.A.F. as a flying officer for 8½ years.

Mr. Robinson, who will be responsible for Warner electro-magnetic brakes and clutches, control equipment, vibrators and grinders, joined the sales staff of the company in 1955. He had previously been with Vickers Armstrong (Engineers), Ltd., specialising in the design and development of electro-hydraulic servo-mechanisms of remote control schemes.

Mr. A. C. Stewart

Mr. P. W. Robinson

Mr. R. E. Kaan, Dipl.Eng., has been appointed export sales manager of S. N. Bridges & Co., Ltd. Mr. Kaan is a regular contributor to technical journals, including the *Electrical Review*. He graduated from the Technical University in Vienna just prior to 1939 and has been living in this country since the war. He was previously export executive of B.E.A.M.A. for a number of years, and was also at one time export director of Philips (Austria).

Mr. R. E. Kaan

Mr. R. Turner has been appointed a managing director of Johnson, Matthey & Co., Ltd. He relinquishes his position as managing director of Mallory Metallurgical Products, Ltd., a subsidiary company, but remains a director.

Mr. C. Warner, general works manager of the Kenwood Manufacturing Co., Ltd., has been appointed to the board. Mr. Warner, who joined the company in 1955, has a wide experience as works manager in both the general and electrical engineering fields.

Mr. C. Warner

The B.B.C. announces the appointment of **Mr. W. H. Thorneycroft,** B.Sc., A.M.I.E.E., as engineer-in-charge of the Moorside Edge transmitting station in succession to **Mr. C. H. J. Wheeler,** who is retiring after thirty-four years' service.

Mr. Wheeler has been with the B.B.C. since the early days of broadcasting, most of his service being at transmitting stations in the North Region. He joined the staff of the Moorside Edge transmitting station in 1930, and became engineer-in-charge in 1935.

Mr. Thorneycroft joined the B.B.C. in 1936 as an assistant maintenance engineer at the Droitwich transmitting station. He became a senior maintenance engineer at that station in 1941, and remained there until 1946 when he transferred to the overseas transmitting station at Skelton, Cumberland. In 1952 he was appointed assistant engineer-in-charge of the Washford transmitting station, and in 1955 he became assistant engineer-in-charge of the B.B.C.'s Sutton Coldfield television station.

The final meeting of the **A.S.E.E. Golfing Society** was held recently at the Wimbledon Park Golf Club when forty members competed for the Thermodare Trophy. The winner was Mr. J. A. Willbourne, the runner-up Mr. J. H. Scott, and Mr. H. K. Bicknell was the "wooden spoonist." Other prizes were won by Mr. A. H. Chesters and Mr. C. Hedin. Mr. E. C. Green (Thermodare, Ltd.) presented the prizes. A dinner followed in the evening, at which Mr. J. H. K. Pendry, national chairman of the A.S.E.E., presented the season's competition winners with their trophies. The Society is holding its ladies' night at the Café Royal, London, on 17th October, and tickets are still available from the hon. secretary, c/o A.S.E.E., 23, Bloomsbury Square, London, W.C.1.

Dr. W. S. Stiles, O.B.E., who has been appointed deputy chief scientific officer at the National Physical Laboratory, qualified as a physicist at University College, London, in 1920. He joined the staff of the N.P.L. in 1925 as an assistant to Dr. J. W. T. Walsh in the Photometry Department. His work was originally concerned with visual problems in illuminating engineering and he made valuable contributions on glare from car headlights and in street lighting and on the use of coloured light in fog. From these applied problems he was led to a series of basic studies of the threshold sensitivity of vision under a wide range of stimulus conditions. One outstanding result was the resolution of the different visual mechanisms concerned in colour vision by methods independent of the traditional colour-matching approach. With Dr. Crawford he was responsible for the discovery of the directional sensitivity of the retina—the Stiles-Crawford effect.

Dr. W. S. Stiles

During the war he was engaged on problems of visibility of interest to the Services, in particular on visual methods of sky-scanning. In 1946 the O.B.E. was conferred upon him and in 1957 he was elected to Fellowship of the Royal Society. Recently he has been re-examining the average colour-matching properties of the human eye which provide the basis for practical colorimetry.

Mr. J. S. Woodrow, who resigned from the office of managing director of the Pulsometer Engineering Co., Ltd., in July, has now also resigned

from the boards of the company and its subsidiaries.

Mr. R. F. Hatto, sales director, has retired from Wolf Electric Tools, Ltd.

Mr. R. F. Hatto

He joined S. Wolf & Co., Ltd., as the company was then known, in 1913 and after the 1914-18 war he was appointed sales manager of the electric tool division. He became sales director in 1939. During the last war the company's manufacturing activities were virtually controlled by the Government and Mr. Hatto then turned his attention to production management, resuming charge of the company's sales at the end of the war.

Members of the Supply Section of the **Institution of Electrical Engineers,** who held their Summer Meeting in Edinburgh from 18th to 21st September under the presidency of Mr. T. E. Goldup, C.B.E., spent the morning of 19th September touring the works of Bruce Peebles & Co., Ltd. On the following evening the visitors, numbering some 325, were entertained to a dinner/dance by the company.

In the rotating plant shop, hydro-electric generators in sizes up to 18 MW were seen in various stages of construction. Great advances have been made in the use of induction generators and a 2·5 MW set for the Cuaich scheme of the North of Scotland Hydro-Electric Board was seen in an early stage of construction. The visitors were also able to inspect interesting examples of large electric motors designed for special applications. Rotors of squirrel cage motors with keyed rotor bar construction were also on view. Large transformers seen in various stages of construction during the visit included one of the 144 MVA units for Kincardine power station.

Viscount Falmouth has been re-elected president of the British Internal Combustion Engine Research Association. **Sir Harold Roxbee Cox, Mr. H. N. Pemberton** (chief engineer surveyor, Lloyd's Register of Shipping), **Professor O. A. Saunders** and **Brig. S. A. Stewart** (Director, Royal Engineer Equipment, Ministry of Supply) have been re-elected vice-presidents, and **Rear Admiral W. F. B. Lane** (Deputy Engineer in Chief, Admiralty) has been elected a vice-president. **Mr. B. D. Giordan** has been elected chairman and **Mr. V. H. F. Hopkins** vice-chairman.

Mr. C. A. Henderson has been appointed general manager of the Eutectic Welding Alloys Co., Ltd He obtained his early technical training in Manchester, since when he has been employed by the Metropolitan-Vickers Electrical Co., Ltd. Before the last war he was seconded to a Rhodesian copper mining company to advise its engineering department on electrical equipment needed for a major expansion programme. His services were employed during the war in providing a special type of power plant required to serve a chain of radar stations. For over nine years Mr. Henderson managed Metropolitan-Vickers Electrical Co., Ltd., affairs in the Middle East. During this time he was chairman of the Middle East Executive Committee of the British Electrical and Allied Manufacturers' Association. He sponsored the gift of almost all the apparatus needed to furnish the laboratories of the new Engineering Faculty in the American University of Beirut and for this work was made a patron of the Faculty. For his services to the technical development of the country, he was invested by the Lebanese Government with the Order of the Cedars of Lebanon. Recently in Manchester, besides his activities with Metropolitan-Vickers, Mr. Henderson has acted as liaison engineer with an associated concern, First Electric Corporation of Johannesburg.

Mr. C. A. Henderson

OBITUARY

Herr Paul Hellermann, president of Paul Hellermann G.m.b.H., Hamburg, and inventor of the Hellermann binding system, has died at the age of seventy-two. The company is a subsidiary of Bowthorpe Holdings, Ltd.

WILLS

Mr. G. L. Wates, late chairman and joint managing director of Johnson & Phillips, Ltd., who died on 22nd January last, left £163,692 gross (£115,970 net).

Major R. Amberton, M.I.E.E., a director of the Dorman Smith group of companies, 1936-1956, and formerly a director of the Electrical Apparatus Co., Ltd., who died on 28th May last, left £5,555 gross (£149 net).

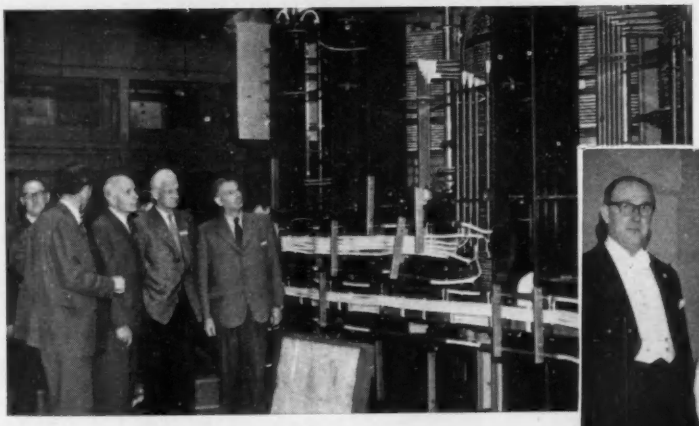
Mr. A. R. Clague, A.M.I.E.E., controller of the South Western Division, Central Electricity Generating Board, formerly chief generation engineer (operation), Midlands Division of the British Electricity Authority, who died on 6th April last, left £11,697 gross (£8,076 net).

Mr. R. W. Hughman, formerly managing director of the *Electrical Times*, who died on 23rd June last, left £26,443 gross (£26,334 net).

Sir James Swinburne, Bt., F.R.S., chairman of Bakelite, Ltd., who died on 30th March last, left £43,368 gross (£43,292 net).

Mr. H. H. Broughton, M.I.C.E., M.I. Mech.E., M.I.E.E., former consulting engineer and for some years head of the Materials Handling Department of Vickers, Ltd., who died on 3rd June last, left £15,001 gross (£14,867 net).

Mr. P. Wardle, A.M.I.E.E., formerly manager, Cannock District, Midlands Electricity Board, who died on 4th July last, left £6,331 gross (£6,288 net).



Members of the I.E.E. Supply Section inspecting a 12 MW, 11 kV, 375 r.p.m. generator at the Bruce Peebles works. Right: Mr. George Henderson (director of Bruce Peebles), Mrs. Henderson, Mrs. Say and Professor M. G. Say who formed the reception party at the dinner-dance

SUBMARINE TELEPHONE CABLE

Canadian Section of Transatlantic Link

A CONTRACT worth $2,500,000 (£892,000) has been placed by the Canadian Overseas Telecommunication Corporation of Montreal with Submarine Cables, Ltd., owned jointly by Siemens Edison Swan, Ltd., and the Telegraph Construction & Maintenance Co., Ltd., for a 460 mile submarine telephone cable system between Newfoundland and the Canadian mainland. It will provide 120 circuits and will form part of the proposed submarine telephone link between the United Kingdom and Canada. The main Atlantic cable is to be laid in the late summer of 1961 and will provide 60 telephone circuits. It will form part of the Commonwealth telephone cable to encircle the world reported on page 622.

A coaxial type cable will be used with a diameter of 0·935in over the insulation. The inner conductor will be a 0·260in solid copper rod, and the outer conductor will comprise six copper tapes, each 0·475in by 0·015in, held in position by a copper binding tape 0·004in thick. The solid inner conductor has advantages of uniformity and improved performance, although its use involves problems of manufacture, extrusion and jointing which have been successfully overcome. Polythene, admixed with small percentages of butyl rubber and antioxidant, will provide the insulation.

Over the outer conductor, a cotton tape coated with Telconax (a mixture of rubber, bitumen and wax) will be applied for protection from corrosion. This will be followed by the conventional jute serving, galvanised steel armour wires and outer serving. At the shore ends double armoured cable will be used for protection against ice. Cable and repeaters will be laid by the contractor's cableship *Ocean Layer*, 4,500 tons.

Telephone circuits will be of high quality with 4 kc/s separation, using the frequency bands 60 to 552 kc/s and 672 to 1,164 kc/s for the two directions of transmission. Cable attenuation at the highest frequency will exceed 1,100 dB, and 20 submerged repeaters will be included in the cable to compensate for this loss. Equipment will be provided on shore at each end for feeding d.c. power to the repeaters through the cable, and to translate the circuits into two supergroups, each of a bandwidth of 312 to 552 kc/s for re-transmission.

Repeater Design

The introduction of amplifying repeaters on submarine cable routes has depended on the development of rigid watertight steel housings having sufficient strength to withstand the pressure at the sea bed and of sufficient internal volume to accommodate valve amplifiers, filters and other apparatus without undue restriction on the electrical design of the repeater. The completed repeaters are approximately 10½in in diameter and 9ft long; in air they weigh half-a-ton. The repeaters are inserted axially in line with the cable and paid out with it from the cableship during laying operations.

The external shape of each repeater is cylindrical. The cable enters and leaves at opposite ends through sealed glands mounted in bulkheads and protected by pressure equalising diaphragms. These bulkheads are brazed into position at the last operation of manufacturing the repeater. Within the housing is an inner container, also sealed and filled with inert gas, which contains the electrical equipment of the repeater. Two valve amplifiers are incorporated in each repeater, each amplifier having three valves. The circuit arrangement is such that the failure of one amplifier would have a negligible effect on the repeater performance.

The repeaters are energised by a direct current sent from the power units on shore. This current is carried along the central conductor of the coaxial cable which is also carrying the telephone circuits; the current passes through each repeater in succession and returns through the sea water surrounding the cable. The current is maintained constant within close limits under all conditions, the supply potential being adjusted automatically to compensate for the potentials developed by magnetic storms or for any other variation.

Provision is made for the location of faulty repeaters from the shore stations. In addition, it is possible to observe the progressive deterioration of an individual repeater in the event of some fault causing that repeater to contribute excessive noise to the system.

Extreme care is needed during the manufacture of both cable and repeaters to ensure a trouble-free life of at least 20 years, and to match the gain of the repeaters to the loss in the cable. The latter is a difficult problem which will be eased by the recent development of a variable equaliser sealed into a submersible housing and adjustable without breaking the seal. The present system will be the first to incorporate this unit, the function of which is to compensate for small errors of equalisation accumulated over the whole route.

Letter to the Editor

Letters should bear the writers' names and addresses not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Persistent Light

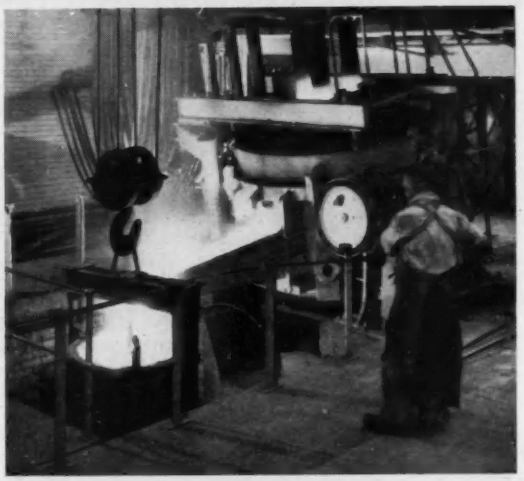
THE note in "Reflector's" column of 19th September about the "disastrous fire at Burley-on-the-Hill" reminded me that I "assisted" (in the French sense of the word) at the splendidly spectacular fire at Madame Tussaud's some time in the middle or late 'twenties. By a subterfuge which must remain a secret I pierced the police cordon and got into the building while it was on fire. Though it was blazing merrily all the lights were still burning, a fact which must have put the hose branch holders in some jeopardy, but did contribute to the remarkable sight of Salvage Corps men carrying Crippen and Mary Queen of Scots to safety!

Yet another case of electric light refusing to retreat in face of the enemy was, of course, in the sinking of the *Titanic* in 1912 when, fortunately, all the ship's lights kept burning until she finally sank. This fact was doubted by some reviewers of the film "A Night to Remember," but is referred to specifically in Second Officer Lightoller's book published 20 years ago or more. The fact helped much to allay the fears of passengers and maintain ordered discipline.

London, W.6. DONAL W. THORPE.

NICKEL ALLOY PRODUCTION

Extension of Henry Wiggin's Hereford Works



Top: Aerial view of the Hereford works showing the area over which they are to be extended

Centre: Pouring from one of the 3 ton electrode furnaces

Below: Sheet being fed from furnaces to the hot sheet finishing stand

BECAUSE of its corrosion-resistant quality, strength, ductility and a reasonable degree of hardness, nickel has many applications in the engineering industry and other fields. Its usefulness has been greatly extended by the wide range of alloys in which it is the principal constituent. The leading producers of these alloys in Great Britain are Henry Wiggin & Co., Ltd., a subsidiary of the Mond Nickel Co., Ltd., which in turn is linked with the International Nickel Company of Canada, Ltd., which mines and processes the metal.

Henry Wiggin & Co. have works at Glasgow, Birmingham and Hereford. The last-named establishment began in 1954 as a factory built for the Ministry of Supply for the production of the " Nimonic " series of nickel alloys. The plant consisted primarily of two 3,500 lb induction melting furnaces, a 5,000 ton extrusion press and hot and cold sheet mills.

Two years later the company purchased the plant from the Ministry and drew up a programme for its modernisation and extension. The first of three stages, with the original plant as a nucleus, was recently completed and last week we visited Hereford to see it. It is hoped to complete the further two stages by 1965 when the present seven acres of factory, laboratory and office buildings will be extended to about 25 acres; the whole site is approximately 52 acres in extent.

At Hereford the main production departments are accommodated under one roof with separate buildings for raw materials and scrap, pickling, metal recovery, laboratory, inspection and stores. There is also a separate boiler

house. In the melting department there are three "Birlec" induction furnaces with a normal capacity of 3,500 lb each, but an additional body of 1,500 lb capacity can be fitted to give a range in size of cast. Each furnace is supplied from a 750 kW, 1,000 c/s generator. The lining is of magnesium-base or silica refractory. There are also two 3 ton "Birlec" arc furnaces with a power input of 2,000 kVA at 82/215 V and 8in diameter graphite electrodes. These are swing-roof charged and are equipped with four bodies interchangeable between furnaces to permit the melting of different alloys without frequent changes of lining. The furnaces have rammed magnesite hearths, high alumina brick side walls and sillimanite brick roofing.

The metal recovery plant is equipped with a 350 lb "Birlec-Detroit" rocking arc furnace, crushers, ball mills, sieves and a Wilfley table.

One section of the machine department is devoted to the trimming up of cast ingots for subsequent extrusion or machining forged billets for sale. The other section handles extruded bar.

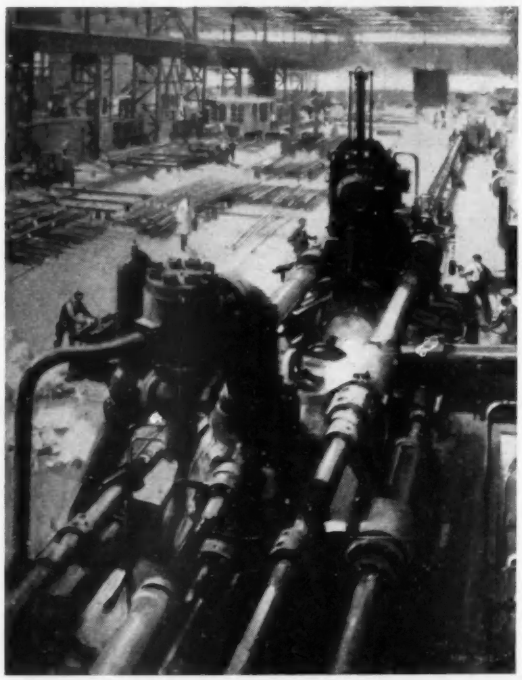
A 5,000 ton Loewy extrusion press is the main feature of the extrusion department. This operates in conjunction with four Wellman gas furnaces. The extrusion dies are normally made of 10 per cent tungsten steel, but results with "Nimonic 90" are said to have been encouraging and this alloy will probably be used exclusively in the future. At present the bulk of the alloys extruded at Hereford are nickel-chromium and nickel-chromium-cobalt base alloys for high-temperature and corrosion-resisting applications. The die life ranges from 30 to 50 extrusions according to the section and the alloys being treated.

Hot rolling equipment consists of a Davy United roughing mill which can reduce 2in bar to 0·2in; a Davy United hot-finishing mill capable of reducing from 0·500in to 0·080in or less by pack rolling; three gas-fired furnaces; a Head Wrightson roller leveller; two Bronx shears; and a Schloemann sheet doubler. The cold rolling plant includes a four-high 300 h.p. Davy United reversing mill with a speed variable up to 150 ft/min; the work rolls are 15in in diameter and 44in long with 38in diameter back-up rolls. There are also two "Birlec" continuous belt annealing furnaces respectively 54in and 32in wide, operating at up to 1,050 deg C. The rest of the equipment consists of three shears, two stretching or flattening machines and two roller levellers.

Samples from each production batch are tested in the laboratories to ensure conformity with specification and here, also, projects for the improvement of materials and processes are initiated and supervised. The main sections deal with analysis, mechanical testing, creep testing, metallography, heat treatment and quality control.

The hot working characteristics of each heat over a wide range of temperatures are determined in the inspection department before processing begins, by bend and compression tests. The internal soundness of extruded bar and sections is checked at various stages by ultrasonic and eddy-current testing. Electro-etching and dye penetrants are used for the final inspection of the machined bar.

Throughout our visit we were impressed by the spaciousness and cleanliness of the works which are situated in one of the country's most attractive areas.



Impression by Terence Cuneo of the 5,000 ton extrusion press

Round-the-World Telephone Cable

THE construction of a round-the-world Commonwealth telephone cable was considered at the Commonwealth Trade and Economic Conference in Montreal on 24th September. It was envisaged that its provision would be based on capital contributions from all Commonwealth countries and that the new cable could be operated on a self-supporting financial basis. The technical and financial issues arising in connection with this proposal were examined at a conference which met in London earlier in the year.

The first transoceanic telephone cable was opened in 1956 between the United Kingdom, Canada and the United States and the construction of a further cable between Canada and the U.K. is expected to be completed in 1961. This would form the first part of the new Commonwealth link. The rest of the route considered by the experts would be as follows:—The west coast of Canada would be linked with New Zealand and Australia and from there the cable would run through the Indian Ocean connecting Malaya, India, Pakistan and Ceylon and from these countries by way of Kenya to South Africa. By providing a link between South Africa and the U.K. connection would be made with transatlantic telephone cables.

The order of construction must be a matter for further consideration but it may be that the existing and proposed links from the U.K. to Canada would first be extended by a cable from the U.K. to South Africa and a cable across the Pacific to New Zealand and Australia; the links spanning the Indian Ocean, to be constructed later, would complete the girdle of the world.

The conference of telecommunications experts estimated that the total length of a round-the-world telephone cable of this nature would be nearly 30,000 nautical miles if the transatlantic crossing were included. The construction cost was estimated at £88 million including the transatlantic cables, and it would take about 10 years to complete. Most of the submarine cables would be laid by the British cable-laying ship *Monarch*.

INDUSTRIAL NEWS

Licensing of "Dollar" Imports

We reported in our last issue (page 568) that a number of classes of imports from the dollar area were to be placed on Open General Licence. The Board of Trade has now made Amendment No. 1 to the Open General Licence (No. 2) by which the following goods (among other classes) are freed from the requirement of specific licences as from 24th September:—

Electrical Goods and Parts.— Accumulators, lead-acid and alkaline; batteries, primary; carbons (furnace, lighting and battery); echo sounding apparatus; electrodes (carbon and welding); fans, other than of a kind used for domestic purposes; generating sets and battery charging sets; insulating cloth or tape; insulators; telegraph and telephone apparatus; terminals; wires and cables.

Machinery and Plant and Parts.— Battery making machinery; cable and rope making machinery; dish-washing machines, other than of a kind used for domestic purposes; dust extractor plant; electric lamp and valve making machinery; electrical machinery, other than of a kind used in motor vehicles, ships, boats or aircraft: converting machinery, generators, motors, rectifiers, starting and control gear for electric motors, switchboards, switchgear, other than articles incorporating timing devices, transformers; electromagnetic separators; electro-plating, tinning, galvanising and similar processing plant; fire and burglar alarm systems; laundering and dry cleaning machinery, other than of a kind used for domestic purposes; lifting, hauling and transporting machinery: capstans, electro-magnets, escalators, jacks, lift clamps, grapples and lifting hooks, lifts, stackers, telphers, transporters and winding skips; portable power tools; railway signalling equipment; turbines, gas, steam and water.

Metal Manufactures. — Boilers, steam: fuel economisers, pre-heaters, superheaters and mechanical stokers, and parts thereof, other than of a kind used for domestic purposes; cable clips.

International Refrigeration Standards

The Council of the British Refrigeration Association entertained to luncheon on 19th September the delegates from ten countries to the inaugural meetings of a Committee formed by the International Standards Organisation to co-ordinate and develop international standards in the field of refrigeration. Mr. J. A. Howie, vice-chairman of the Association, presided at the luncheon, the chief guests being Sir Roger Duncalfe and Dr. Ezer Griffiths, presidents respectively of the International Standards Organisation and the International Institute of Refrigeration. Lord Dudley Gordon, chairman of the Committee, also attended.

Road Heating Experiment

The Slough Borough Council has been asked by the Road Research Laboratory to agree to the installation of an electric heating system in a length of about a quarter of a mile of the Uxbridge Road in which an improvement scheme is being carried out. The system would be automatically controlled and the cost of the work would be borne by the Ministry of Transport.

The Research Laboratory has already carried out experiments in ice prevention on roads using grids of insulated cable embedded below the asphalt surface of roads. Adjustable loadings of from 1 to 10 W/sq ft have been used, control being by means of a thermo-hygrostat consisting of an arrangement of transistors and relays operated by thermistors used as temperature-sensitive elements.

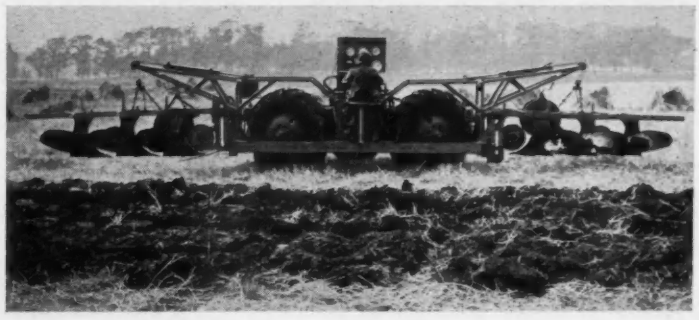
Electric Tractor Plough

The first public demonstration of a prototype electric powered tractor recently took place in Scotland. The tractor was constructed by the Carron Company in collaboration with the Ministry of Power and Major A. McDowall, of Castle Douglas.

It consists of a 30 h.p. squirrel cage induction motor, a hydraulic transmission system, two land wheels driving in tandem and a third outrigger wheel which, besides acting as a stabiliser, serves to carry the cable drum and winding gear. The whole is mounted in a tube and channel chassis with ploughs fore and aft.

The supply is drawn from the grid through a transformer at 440 V three-phase. Twisting and dragging the cable is avoided by a sideways movement and the cable is paid out or wound in as the tractor moves away from or towards the power source. The electric motor drives a Derri hydraulic pump which supplies the low speed, high torque Staffa hydraulic motors which are mounted directly in the driving wheels. Maximum tractive effort with both motors operating at 1,500 p.s.i. is 3,200 lb.

Prototype electric plough being demonstrated



Revised "Kite-mark"

The British Standards Institution has re-designed its "Kite-mark" which is "leased" to manufacturers for use as an independent assurance that their goods conform to British Standard requirements. As will be seen from the illustration, the mark now bears the inscription "Approved to British Standard" and the B.S.I.'s Mark Committee is anxious that existing licensees shall introduce the revised form as soon as possible. The mark is in three sizes—2in, 1in and ¾in diameter.

New B.S.I. "Kite-mark"

Transformers for Northern Ireland

The Electricity Board of Northern Ireland has placed a contract for four 2,000 kVA, 33/11 kV, and two 1,000 kVA, 33/11 kV, step-down transformers with Gresham Transformers, Ltd. The transformers are fitted with the fully automatic on-load tap changing equipment made by the Metropolitan-Vickers Electrical Co., Ltd.

Lamp Wholesalers' Conference

The annual "Atlas" wholesale distributors' conference held this year at the Connaught Rooms, London, was attended by more than 140 wholesalers from all over the country. During the evening session, presided over by Mr. J. G. Christopher, director and general

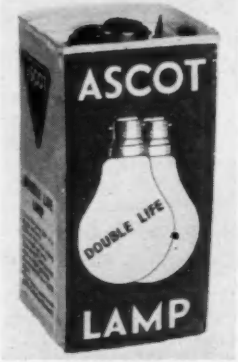
sales manager of Atlas Lighting, Ltd., delegates were given details of the company's policy, new products and publicity for the coming season. Following the meeting the delegates went to Greenwich Park to see "Son et Lumière," which has been presented this year by Atlas Lighting, Ltd., on behalf of the Ministry of Works. At dinner in the National Maritime Museum, Greenwich, the company was addressed by Mr. J. Thorn, chairman and managing director of Thorn Electrical Industries, Ltd., and Mr. D. Mitchell, president of Sylvania Electric Products, Inc.

Water Turbines for Karadj (Iran) Power Station

The Harland Engineering Co., Ltd., has received a contract for the water turbines and governors to be installed in the new power station now being constructed in the Elburz Mountains near Teheran, Iran, for the Karadj Dam Authority by Morrison-Knudsen International Constructors, Inc., and their consulting engineers, the Harza Engineering Co. International. The "Harland-Morgan Smith" vertical Francis water turbines to be installed in 1960 are rated at 56,000 b.h.p. under 482ft net head at 333 r.p.m. and each is capable of producing approximately 80,000 b.h.p. under maximum head conditions. There will be special features in the design of the turbines to meet a very wide head range. Power from the station, which is designed for three generating sets, will be transmitted to Teheran, approximately 29 miles away. The machinery will be built in Harland's Alloa Works.

Industrial and Commercial Heating Exhibition

The South Western Electricity Board held an exhibition at Electricity House, Bristol, last week of industrial and commercial heating equipment, with particular emphasis on thermal storage heaters. The exhibition is to visit all main local centres in the Board's area.



Left: The carton which Ascot Lamps and Lighting, Ltd., has designed for its new "double life" coiled-coil lamps

Right: The "Brighter Light Brigade" character which Siemens Edison Swan, Ltd., is embodying in its lamp sales campaign material

Telecommunications Brochure

The Automatic Telephone & Electric Co., Ltd., has issued an illustrated booklet in which it summarises the resources and activities of the company and its subsidiaries which are concerned with telecommunications. Reference is also made to British Insulated Callender's Cables, Ltd., and the Telephone & General Trust, Ltd., with which groups the Automatic Telephone & Electric Co. group is associated.

Lamp Publicity

A feature of this season's lamp sales campaign by Siemens Edison Swan, Ltd., which has the slogan "Join the Brighter Light Brigade," is a new character embodying the spirit of service. Depicted as seated astride a horse he gallops confidently ahead carrying his lance—a fluorescent lamp—and underneath his saddle a filament lamp. The character is prominent in display point-of-sale aids, which include an animated "rocking horse" showcard, double crown posters and showcards, self-adhesive shelf-edge stickers, and circular window stickers in p.v.c. sheet.

Ascot Lamps & Lighting, Ltd., has produced a special lamp carton for its improved coiled-coil filament lamps.

Foundry News Sheet

The Butterley Co., Ltd., Ripley, Derby, has instituted "Butterley Foundry News" which it proposes to issue "at least three times a year." Its object is to inform buyers of castings of developments at the Butterley foundry, new manufacturing equipment processes and new applications of the company's materials. Articles included in the first issue deal with the production of feed heads, a description of "Meehanite" and foundry welfare.

Radar Equipment for Swedish Air Force

Decca Radar equipment is included in an order placed by the Royal Swedish Air Board with Bristol Aircraft, Ltd. The order covers the provision of the Bristol/Ferranti Bloodhound guided weapon system complete with all the necessary control equipment. Decca will be responsible for the control and data equipment required to direct special weapon radars on to the selected targets.

Mr. A. N. Irens, chairman of the South Western Electricity Board, opening the "Heating for Business and Industry" Exhibition at Electricity House, Bristol. On his right is Mr. G. W. Richards, of the Board's Bristol Sub-Area

Atlas Lighting Conventions

The first of a series of eleven lighting conventions to be held in various parts of the country in the course of the next two months, was held by Atlas Lighting, Ltd., on Thursday and Friday last week at St. Pancras Town Hall, London, and over 600 representatives of the electrical and hardware trades attended each day.

As in previous years a stage production was presented, the title this year being "Life with the Livingstones"; in addition, a section of the hall was given over to a display of the latest of the company's "Popular Range" of fluorescent lighting fittings. The play, which depicted a day in the life of an architect and his wife (a

buyer in a departmental store), opened at breakfast time in the Livingstones' kitchen. This was followed by scenes at the departmental store, the architect's office, a works engineer's office, and a visit by the Livingstones to a cinema, in which a well-produced film showing the manufacture of lamps at the company's factory was skilfully introduced; the final scene showed a shop window display, in which the clever use of spot lighting on women's clothes persuaded Mrs. Livingstone to dip into her cheque book.

The script was amusingly written, and each scene showed the many uses for Atlas lighting equipment. Anthony Scales as the architect, Ann King as his wife, and Harry Hewitt, who played a number of roles, gave point to the special features of each fitting, and the scenes were linked up by Derek Guyler, the narrator. Mr. J. G. Christopher (director) welcomed the visitors and said that the company anticipated that the conventions would be attended by over 6,000. Dr. H. H. Ballin (director and technical sales manager) also addressed the gathering at the end of the play. The dates of the other conventions and the towns in which they will be held were given in our last issue.

Batti-Wallahs' Society

The monthly luncheons of the Batti-Wallahs' Society were resumed last week after the holiday period, Mr. H. H. Spencer (the president) being in the chair. The guest speaker was Mr. James Laver, director of the Victoria and Albert Museum, who in a lively address on fashion and its origins showed how both male and female attire through the ages had been influenced by such factors as architecture and sport. Sir Edward Crowe, an hon. member of the Society, proposed a vote of thanks to the speaker, saying that he was an acknowledged international authority on this subject.

Shop Lighting Campaign

We have already reported that the British Lighting Council has arranged a series of conferences in provincial centres in connection with its 1958-59 Shop Lighting Campaign. The first of these was held at the Queen's Hotel, Birmingham, on Wednesday last week and we reproduce a photograph taken on the occasion.

The new Brush mobile demonstration van

Generating Plant for Spain

The British Thomson-Houston Export Co., Ltd., has obtained a contract from Fuerzas Electricas de Cataluna, of Barcelona, for a 60 MW steam turbine generator, boilers, and all auxiliary plant. The sub-contractors for the boilers are John Thompson, Ltd., Wolverhampton, and the sub-contractors for the civil engineering design and layout, Balfour, Beatty & Co., Ltd. The turbo-alternator will be made at one of the works of the A.E.I. turbine-generator division. The value of the contract is £2,250,000.

Bakelite Price Reduction

Bakelite, Ltd., announces a reduction of 2½d per lb in the United Kingdom prices of standard grades of its polyethylene resins, compounds and master batches.

Brush Mobile Exhibition

A new mobile demonstration vehicle, containing switchgear exhibits, built by the Brush Electrical Engineering Co., Ltd., Loughborough (a member of the Hawker Siddeley Group) is now on its first tour of Electricity Board areas. The two exhibits being shown are high voltage extensible outdoor ring-main unit type HF-OJ, and a v.b.c. vertical isolation horizontal draw-out metalclad switchgear unit. Invitations to visit the exhibition have been sent not only to Electricity Board officials, but also to C.E.G.B. engineers and industrial users throughout the area, including the National Coal Board. The van is built on a Bedford six-wheeled articulated chassis and each side drops to form an entrance and platform which can be enclosed with "Perspex" side panels.

British Pumps for German Reactor

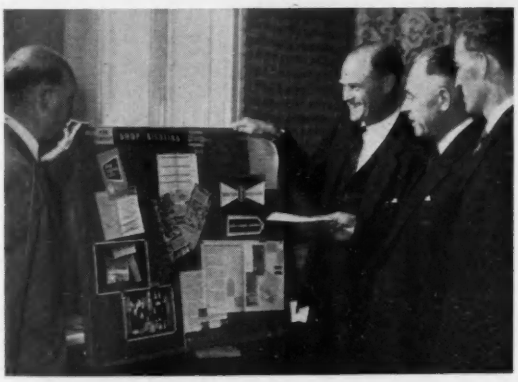
Hayward Tyler & Co., Ltd., members of the Platt Brothers group, have received instructions to supply three heavy water main coolant glandless circulators for the German materials testing reactor to be built at Julich.

Purchase Tax Notice

The Commissioners of Customs and Excise, King's Beam House, Mark Lane, London, E.C.3, have issued a new Purchase Tax No. 78 Notice (October, 1958) superseding Notices Nos. 78 (January, 1958) and 78N (April, 1958). It has been brought up to date by the inclusion of amendments made since the two superseded notices were published.

Scottish Electrical Training Scheme

A one-day conference of trainees under the Scottish Electrical Training Scheme was held on 24th September at Paisley. About 100 students attended the conference, which took the form of a tour of the works of two of the member companies' premises followed by a luncheon. The works visited were those of Scottish Cables, Ltd., Renfrew, and James Kilpatrick & Son, Ltd., Paisley. Mr. K. W. Atchley (works director, Harland Engineering Co., Ltd.), who is the chairman of the scheme, speaking at the luncheon at Paisley Town Hall, explained that the object of the scheme was to give the students the best possible start in their careers, and Mr. J. E. C. McCandlish, organising secretary, said that the scheme would train young men for top level posts in the engineering world. It was to stop the drift of such young men from Scotland to England that the eight companies concerned had joined in the scheme. It was proposed, he said, to start a series of meetings at which graduates of the



Left to right: Mr. J. H. Boardley, chairman, Birmingham Branch, Electrical Contractors' Association, Mr. E. B. Sawyer, secretary of the B.L.C., Mr. G. Redmond, chairman, Central England Regional Committee, B.L.C., and Mr. G. E. Kemp, Midlands Electricity Board

scheme would meet in Glasgow and discuss technical and managerial problems and acquire knowledge from experts in particular fields.

Works Visit

During a visit to the Oxted works of Lancashire Dynamo Nevelin, Ltd., Mr. W. R. T. Skinner (deputy chairman, South Eastern Electricity Board), Mr. T. A. D. Honnor (manager, Croydon and West Kent Sub-Area) and Mr. J. McAlister (district manager) saw many of the company's latest developments in switchgear, motor control gear and rectifiers. The visitors were received by Mr. S. F. Steward (managing director, Lancashire Dynamo Group) and Mr. V. W. Press (sales director, Lancashire Dynamo Nevelin, Ltd.).

Mr. W. R. T. Skinner (centre), deputy chairman, South Eastern Electricity Board, examines a new design of busbar with Mr. V. W. Press (sales director, Lancashire Dynamo Group), during his visit to the Oxted works of Lancashire Dynamo Nevelin, Ltd. On the right is Mr. S. F. Steward (managing director, Lancashire Dynamo Group)

Italian Nuclear Station Contract

The Italian Societa Elettro Nucleare Nazionale (S.E.N.N.) announced last week that it had awarded the contract for the 150 MW nuclear power station to be built on the Garigliano river, between Naples and Rome, to the International General Electric Company of New York. Seventy per cent of the component parts will be made in Italy and it is understood that the station will be similar to the one the General Electric are building at Dresden, near Chicago. This uses a dual cycle boiling water reactor, fuelled with enriched uranium, and is scheduled for completion in 1961 at a "turn key" contract price of $45 million. If the $15 million included in this figure for research and development is omitted, the Dresden station is expected to produce electricity for about 0·75 cent per kWh.

Nine tenders were submitted for the Italian station and these were examined by international experts selected by the World Bank and the Italian Committee for Nuclear Research. Discussions between S.E.N.N. and the World Bank regarding a loan to finance the plant are still in progress. Of the eight unsuccessful tenders, three came from the United States (Atomics International, H. K. Ferguson Co., and Kaiser), four from the United Kingdom (A.E.I.-John Thompson, G.E.C.–Simon-Carves, English Electric, and Mitchell Engineering) and one from France (Alsthom).

Forty Years of Electrical Progress

The opening meeting of the new session of the Ipswich and District Electrical Association was held on 22nd September at Electric House, Ipswich, Mr. H. C. Waters, the new president, taking the chair. Mr. A. White (chairman of the Association) gave an address on "40 Years of Electrical Progress," in the course of which he dealt with the advance in design, and the changes in particular, of the lighter electrical equipment. He referred to the introduction of new materials and the changes in the design of domestic electrical appliances and street lighting equipment. Following his address a colour film of the lighting of the Niagara Falls was shown.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £180 0s 0d
COPPER, H.C. Electro	ton £212 0s 0d
Fire Refined 99·70%	ton £211 0s 0d
Fire Refined 99·50%	ton £210 0s 0d
COPPER Tubes ..	lb 2s 0½d
Sheet	ton £242 5s 0d
H.C. wire and strip ..	ton £262 5s 0d
LEAD, English ..	ton £70 2s 6d
Foreign	ton £69 0s 0d
MERCURY	flask £79 0s 0d
TIN, block (English) ..	ton £723 10s 0d
ZINC, G.O.B. Foreign	ton £65 10s 0d
BRASS Tubes (solid drawn)	lb 1s 7½d
Wire	lb 2s 5½d
PHOSPHOR BRONZE Wire	lb 3s 9½d
PLATINUM	oz £21 5s 0d
RUBBER, No. 1 R.S.S. spot	lb 24½d—24¾d

Downes & Davies Jubilee

At a recent informal ceremony, Mr. P. L. Davies and Mr. T. Woods, governing directors of Downes & Davies, Ltd., of Liverpool, were the recipients of presentations from the staff and from their fellow directors, to mark the golden jubilee of the company. Speaking at the ceremony, Mr. A. Pugh said that the company was founded by Mr. H. L. Downes and Mr. P. L. Davies in 1908 at 69, Stanley Street, and was shortly afterwards joined by Mr. T. Woods. Following the death in action of Mr. Downes, Mr. Davies and Mr. Woods continued in private partnership until 1947 when the present limited liability company was formed, Messrs. T. D. Woods, E. L. Wiard, J. H. Mellor and B. C. Davies being appointed directors. A branch was opened in Manchester in 1912 and the Carlisle branch was opened in 1930, being followed by branches in Birkenhead in 1934 and Workington in 1946.

Spin Dryer Publicity

Parnall (Yate), Ltd., has prepared a broadsheet that it is distributing to dealers and Electricity Boards outlining its "Automagic 260" spin-dry washing machine autumn advertising campaign in the *Radio Times* and major provincial newspapers. The broadsheet includes details of a "50/50" co-operative advertising scheme open to all dealers, and illustrations of sales aids and advertising blocks available.

Design Centre Experiment

The late opening of the Design Centre, 28, Haymarket, London, S.W.1, on Thursdays has proved so popular that during the winter months (1st October to 21st March) it will also remain open on Wednesday evenings until 7 p.m.

Trade Announcements

The **U.A.M. Group** announces that from 8th October the telephone number for its head office at Tolpits, Watford, Herts., will be Watford 34551. This change applies to the Universal Asbestos Manufacturing Co., Ltd., U.A.M. Plastics, Ltd., Union Fibre Pipes (Great Britain), Ltd., and Universal Asbestos (Overseas), Ltd.

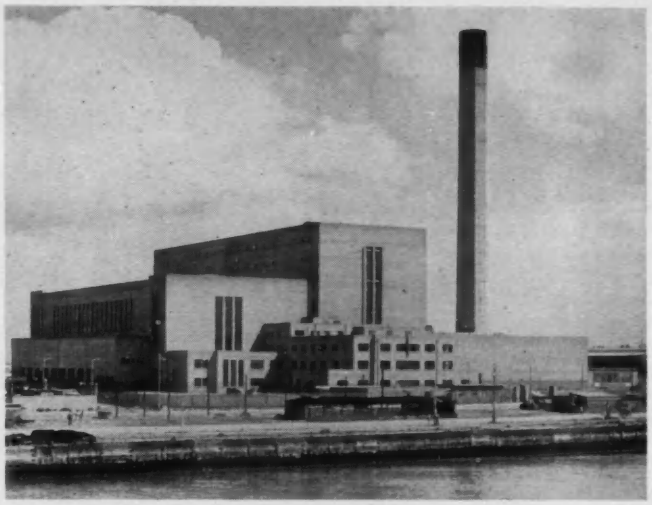
Drake & Gorham, Ltd., have acquired new premises for the parent company at 68, St. Ann Street, Salisbury (telephone: Salisbury 6544). Correspondence for the parent company, Mr. H. M. Drake, Mr. W. Parker and Mr. W. B. M. Drake should in future be addressed to the Salisbury office. This move has become necessary owing to the continued growth of Drake & Gorham (Contractors), Ltd., who will now be able to expand into accommodation vacated by the parent company at 36, Grosvenor Gardens, S.W.1 (telephone: Sloane 0121).

The **British Central Electrical Co., Ltd.,** has appointed Mr. S. W. G. Page as its speciality salesman. Mr. Page was previously with the New Switchgear Construction Co. as a lighting engineer and representative and was a representative for Siemens Electric Lamps & Supplies, Ltd. (Siemens Bros. & Co., Ltd.), for over four years. He is based at the London office.

The **London Electric Wire Co. & Smiths, Ltd.,** announces the completion of the extension to its branch premises at Lewcos House, 110-120, Mosley Street, Birmingham.

South Denes Power Station

Great Yarmouth Oil-Fired Plant Inaugurated



General view of South Denes power station

THE new power station at South Denes, Great Yarmouth, was opened last Friday by Col. Sir Edmund Bacon, Bt., O.B.E., T.D., J.P., Lord Lieutenant of the County of Norfolk. The station, which contains four 60 MW turbo-alternator sets with oil-fired boilers, was described in detail in the *Electrical Review* of 20th June last. It was originally designed for coal firing, but towards the end of 1955 it was decided to convert it to oil burning using residual oil as a fuel. The first 60 MW unit was commissioned in September, 1957, and the second was brought into service last March. Construction is still proceeding and it is planned to bring the third unit into service in May, 1959, and the final set in January, 1960.

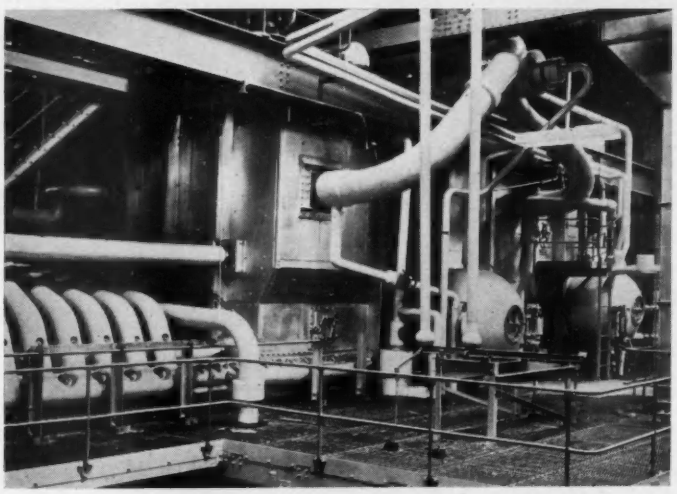
The station occupies a site of 19·5 acres with a separate site of 12·5 acres, originally intended for coal storage, on which the three oil storage tanks will be situated. Both sites are on a narrow strip of land between the River Yare and the North Sea.

The two main features of the station are the central control room, which includes the four boiler/turbine unit control panels, and the sequential control system for the second two turbo-alternator sets. Starting up and control of the boiler/turbine unit is completely carried out from the unit console in the central control room and the operation of a single push-button will automatically start up Nos. 3 and 4 units.

The completed station will accommodate two three-drum boilers by International Combustion, Ltd., and two two-drum boilers by Mitchell Engineering, Ltd. Each has a maximum continuous evaporative capacity of 550,000 lb/hr, the pressure and temperature of the steam at the superheater outlet being 950 p.s.i. and 910 deg F with a final feed temperature of 385 deg F.

The Metropolitan-Vickers Electrical Co., Ltd., supplied Nos. 1 and 2 turbo-alternators and Richardsons Westgarth (Hartlepool), Ltd., will supply Nos. 3 and 4. The first two sets are two-cylinder units of the impulse type and Nos. 3 and 4 machines are of the two-cylinder combined impulse and reactor type. All four machines operate at 3,000 r.p.m., are hydrogen cooled at 15 p.s.i., and are designed to operate with steam at 900 p.s.i. and 900 deg F at the turbine stop valve with 28·9in vacuum. The alternators generate at 11·8 kV and the output of the first two sets is fed directly into British Thomson-Houston 72 MVA, 11·8/33 kV generator transformers. Nos. 3 and 4 generators will be solidly connected to B.T.H. 72 MVA, 11·8/132 kV generator transformers which will feed the new 132 kV switching station equipped with Metropolitan-Vickers switchgear. The 33 kV and 3·3 kV switchgear has been supplied by the English Electric Co., Ltd.

The station was designed by the engineering staff of the C.E.G.B., Eastern Division, the architectural treatment being under the direction of the divisional architect, and Messrs. Rendel, Palmer & Tritton are acting as civil engineering consultants.



Drum level of No. 1 boiler

GENERATION AND DEVELOPMENT

Proposed Suffolk Nuclear Station

The Central Electricity Generating Board is to make application to the Minister of Power and to the local planning authority for consent to develop a site at Sizewell for its sixth nuclear power station. The site is mainly heath and woodland on the coast two miles to the east of the town of Leiston. The subsoil is capable of supporting heavy reactors and the vast quantities of water required for cooling purposes can be taken from the deep water which is reasonably close inshore. The area is generally above flood level and locally the coast line is stable. The proposed station will have an output capacity of about 650 MW and the site is capable of further development. The station would be connected to the 275 kV national grid system by transmission lines proceeding westward from the site.

Bulk Supply Tariff Reduced

The running charge of the Central Electricity Generating Board's bulk supply tariff has been reduced from 1st October for the remainder of the current financial year ending 31st March next. The tariff, which applies to all Area Boards on a uniform basis subject only to an area fuel cost adjustment, is of the two-part type, incorporating a fixed charge of £6 per kilowatt of maximum demand and a running charge which has now been reduced from 0·47d to 0·46d per kWh.

At a Press conference this week in Bristol, Mr. A. N. Irens, chairman of the South Western Electricity Board, said that the Board was passing on the benefits to consumers by way of a reduction in the off-peak tariff, which in general terms would be reduced by about two shillings in the pound. There would be no increase in electricity charges in the West Country for the next year.

The Eastern Electricity Board has also announced that the reduction in the cost to the Board of bulk supplies of electricity will be passed on to consumers by allowing rebates to industrial consumers with high load factors and to domestic, commercial and farming consumers who pay for their electricity on special night and day and week-end rates designed to promote off-peak use.

Blyth "B" Power Station

The Central Electricity Generating Board has received the consent of the Minister of Power to the extension of Blyth power station by the addition of a new section to be known as Blyth "B." The installation will comprise generating plant having a capacity of approximately 1,200 MW and four coal-fired boilers. The station is planned to be brought into commission in 1962.

Milled-Peat Power Station

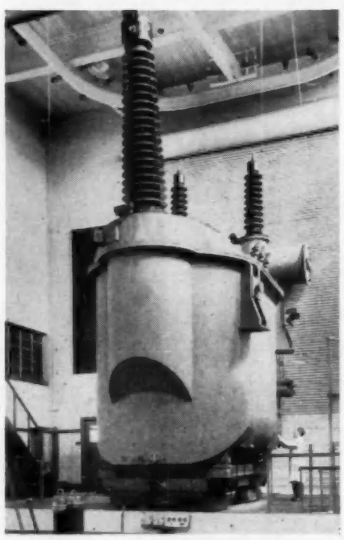
The first power station outside the U.S.S.R. to use milled peat for the production of electricity was opened at Ferbane, Offaly, Eire, on 15th September. Mr. R. F. Browne, chairman of the Electricity Supply Board, said that what was being done would in no way interfere with a nuclear power programme when it became feasible to introduce it.

Mr. Sean Lemass, Minister for Industry and Commerce, opening the station, said it represented another triumph for Irish engineering skill. The switch-over to milled peat came largely on the initiative of Bord na Mona (Peat Board). It was a matter for gratification, he said, that they were obtaining from the peat bogs an efficient fuel at lower cost than that of any other solid fuel available in the country.

OVERSEAS

Argentine-Uruguayan Agreement

The "Fortnightly Review" of the Bank of London & South America states that the Argentine and Uruguayan Governments on 27th August exchanged ratifications of the agreement on the joint development and use of the hydro-electric potential of the Salto Grande falls on the River Uruguay, which forms part of the frontier between the two countries. The agreement was actually made in 1946 and schemes for the harnessing of the falls are already in existence.



This 330 kV transformer, seen on test at the English Electric Co.'s Stafford Works, is now on its way to Australia. It is a single-phase unit for a 162 MVA bank ordered by the Electricity Commission of New South Wales

Finance for Malayan Power Scheme

A loan of $35·6 million has been approved by the World Bank towards the financing of the Cameron Highlands hydro-electric scheme in the Federation of Malaya. The loan is to be made to the Malayan Central Electricity Board which is responsible for the project. The total cost of the first stage is put at $51·2 million and the Bank's loan will meet the foreign exchange needs. A further $1·4 million is being lent by the Commonwealth Development Finance Company. The Colonial Development Corporation has extended by about 25 years the terms of its £7,100,000 loans made in 1950-53 in respect of the construction of the Board's Connaught Bridge 80 MW steam station.

Hydro-Electric Power in Nyasaland

A scheme is under review by the Federal Power Board to provide hydro-electric power in Nyasaland at an estimated cost of £2·5 million, reports Barclays Bank D.C.O.'s *Overseas Review*. The Bank states that the scheme on the Shire River would have an initial stage output of about 15 MW and could be expanded to a capacity of 22·5 MW, with a possible second stage development that would bring the capacity up to 50 or 60 MW.

Large New Australian Station

The Premier of New South Wales, Mr. J. J. Cahill, recently opened the Wallerawang power station, near Lithgow. It cost £24 million and will have a capacity of 240 MW when completed in 1962.

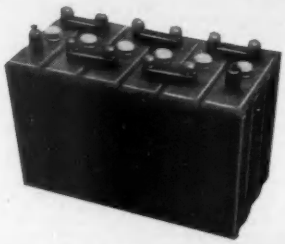
Process Heating Exhibition

An industrial process heating exhibition, arranged by the Merseyside and North Wales Electricity Board in conjunction with the Metropolitan-Vickers Electrical Co., Ltd., is being held at the M.A.N.W.E.B. Development Centre, Paradise Street, Liverpool, until 10th October. Among the wide range of products displayed is a complete working paint stoving plant illustrating the high production rate achieved with the new Metrovick infra-red projector equipment. Other items include tyre dryers, immersion heaters, workshop process heaters, etc., showing how Metrovick elements can be built into users' equipment. In addition to the Metrovick equipments the exhibition includes a Birlec furnace for heat treatment of components, and many examples from the range of workshop heating appliances by Barlow Whitney, Ltd.

NEW ELECTRICAL EQUIPMENT

Replaceable Cell Battery

A battery comprising separate replaceable interlocking 2 V cells is announced by DIAMOND (B.E.P.), LTD., Star Chemical Works, Watts Grove, Bow, London, E.3. The individual cell casings are moulded from Alkathene in a variety of colours; the cases are translucent, enabling the electrolyte level to be readily checked. Brass, copper or stainless steel terminals are available and raised moulded symbols on each cell ensure correct connection. The "Sepcel" battery is supplied in four capacities from 43 to 70 Ah at a 20 hour rate, with standard charging and maintenance procedures.



Diamond "Sepcel" battery

Earthing Rod

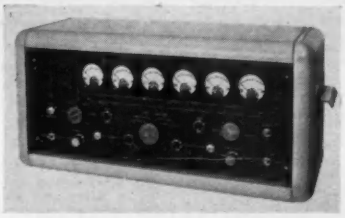
An earthing rod comprising a steel core with a fusion welded copper sheath, widely used in the United States and Europe, is now available from the STEMET EARTHING CO., LTD., 17, Northburgh Street, Clerkenwell, London, E.C.1. The rod is cold rolled, making it rigid and therefore suitable for driving into the ground, and the copper sheath is indivisibly fused to the steel, eliminating the corrosion associated with ferrous rods.

Sectional rods have been developed for deep earthing, having rolled threads at each end for joining together with couplings. The rods are obtainable in diameters of ½, ⅝, ¾ and 1in, and lengths of 5, 8 and 10ft. The couplings are made of bronze, threaded to fit the rod sections, and steel driving bolts are used to take the hammer blows. Ground clamps, eliminating the need for soldered connections, can be supplied with cast or drawn bronze bodies, both types of clamp giving a high pressure contact between the earth wire and the rod.

Microsecond Stopclock

The Venner transistorised microsecond stopclock Type TSA 24 employs a range of high-speed counting stages to form a comprehensive time measuring equipment capable of measuring pulse widths, mark/space ratios, period of pulse or other waveforms having amplitudes between 0·75 V and 500 V peak.

Facilities are embodied to carry out most types of time measurements on contacts without the use of ancillary power supplies. The clock is inherently self-checking on the applied waveform and has in addition six internally generated waveforms from 10 c/s to 1 Mc/s which can be brought via a switch and emitter follower to a panel-mounted socket. The time range of the basic equipment is 3 microseconds to 1 second, but this can be extended to 27·8 hours by the addition of a plug-in counter available at an extra cost of £27.



Venner TSA 24 microsecond stopclock

Housed in a cabinet 22in long by 10in high by 8in deep and priced at £330 when operating from a 12 V d.c. supply only, or £350 functioning from 12 V d.c. or 230 V a.c., the stopclock is obtainable from VENNER ELECTRONICS, LTD., Kingston By-Pass, New Malden, Surrey.

Standard Cubicles

Heavy duty cubicles designed primarily for the electrical industry and made in two standard types, for use as control or apparatus cubicles, are announced by ALFRED IMHOF, LTD., Ashley Works, Cowley Mill Road, Uxbridge, Middlesex. Each is available in two standard sizes, 87½in high by 25in deep by 29 or 41in wide.

The basic structure consists of formed 10 s.w.g. steel front and rear frames mounted on a heavy fabricated steel base with radiused side panels and a removable top cover. Fully gasketed doors with three-point lever-type locks are mounted on lift-off hinges, and a formed front panel is fitted on the control cubicle. Adjustable internal frameworks, designed to take standard Post Office relay racks, are supplied for mounting control gear or other equipment. Special front panels, mimic diagrams, and internal strip lighting with door-operated switches are among the optional extras available.

Vacuum Cleaner

The new "Junior" cleaner, model 1334, just introduced by HOOVER, LTD., Perivale, Greenford, Middlesex, is said to represent a considerable advance in efficiency in addition to other advantages, notably an ingenious device for the instant attachment of cleaning tools.

Compared with the company's previous "Junior" model, it is lighter and more compact and has a longer and more streamlined appearance. It is fitted with a newly designed 250 W motor, giving greater suction power, and agitator beater bars and brushes operate over a 15 per cent wider area. Its overall height is less than that of the previous model and this, combined with its adjustable handle, enables the machine to go under low-built furniture with ease.

The motor control is by foot switch and the handle, adjustable to a flat position, is controlled by a further foot-operated switch. Easily fitted paper bags, contained in the outer fabric bag, are used for the quick and hygienic removal of the dust.

The cleaner is designed for complete household cleaning and is equipped with "Hooverflex" double-stretch hose for use with its lightweight cleaning tools. The cleaning tool attachment device automatically uncouples the agitator driving belt from the motor pulley when the tools are to be used. An all-round furniture guard made of soft non-scratching plastic is fitted to the cleaner.

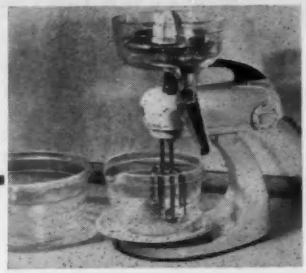
The machine is doubly insulated, conforming to B.S. 1645, and is fully suppressed against radio and television interference. The price, complete with cleaning tools and hose, is £29 18s 6d including purchase tax.

Hoover "Junior" model 1334 vacuum cleaner with attachments

DOMESTIC ELECTRICAL EQUIPMENT

FOOD MIXERS

Manufacturer	Name or Model	Capacity	Standard Equipment	Special Features	Finish
BROWN BROTHERS, LTD., Great Eastern Street, London, E.C.2.	" Duco "	Small bowl, 2 pint. Large bowl, 5 pint	Two glass mixing bowls	Beating speed variation, 250–750 r.p.m. T.V. interference suppressors .	White enamel, black fittings and base
ENGLISH ELECTRIC CO., LTD., East Lancashire Road, Liverpool, 10.	" 5500 "	Small bowl, 2 pint. Large bowl, 5 pint	Two clip-in beaters, turntable and two ridged bowls	Portable mixer head, 20-speed control dial	Cream or white, candy pink, aquamarine, and lavender
FRAIKAD, LTD., 139-141, Farringdon Road, London, E.C.1.	" Romix Super "	4 pint	Juice extractor, Blender, shredder and dough mixer optional	Swiss manufacture	" Melamin "
	" Romix Combi " Mk. II	4 pint	Juice extractor, blender and shredder	Swiss manufacture	" Melamin "
	" Rotary Combinette "	—	Mixer with coffee grinder attachment	French manufacture	Plastic
HILLMAN ELECTRIC MOTORS, LTD., Crane Grove, London, N.7.	" Hillma-mix "	1 pint	Liquidiser	Portability, two-speed control	Red, blue, green, primrose, white or cream
KENWOOD MANUFACTURING CO., LTD., Old Woking, Surrey.	A.700D " Chef "	6 pint	" K " beater, whisk, dough hook, glass bowl and plastic cover	Planetary mixing action, wide variety of attachments. Double insulated	Cream or white stoved enamel with choice of 5 coloured accessories
	A.300 " Minor "	—	Two beaters, wall bracket	Portability, hangs on wall when not in use	White with black relief
	A.310 " Minor De-Luxe "	3 pint	Stand, bowl and beaters	Can be used as portable mixer	White with black or chromium relief
	A.955 " Kenmix 55 "	1 litre	Liquidiser and power unit	Can be taken apart for easy cleaning	White stoved enamel
MIDLAND REPETITION & AUTO MANUFACTURING CO., LTD., Bayton Road, Exhall, Coventry.	" Rapide Mixstir "	3 to 5 pints	Two bowls, two beaters and juice extractor	Governor controlled motor gives full power at any speed	White and black stoved enamel
MORPHY-RICHARDS, LTD., 50, Conduit Street, London, W.1.	—	—	Two whisks, two paddles	Lightweight, thumb rests near on/off switch	Ivory, ivory/red or ivory/blue plastic
P.L.N., LTD., 152, Walton Street, London, S.W.3.	" Paladin " Senior	1 litre	Motor unit, feeder lid goblet, spatula	4-speed liquidiser, convertible to cake mixer with gear box and mixing bowl attachment	White or cream stoved enamel, glass goblet
SIROMA ENGINEERING CO., LTD., North Acton Road, Harlesden, N.W.10.	" FM4A "	Small bowl, 2 pint. Large bowl, 5 pint	Two bowls, two beaters and recipe book	Governor controlled motor gives speeds between 250 and 750 r.p.m.	White stoved enamel body, black base
SUNBEAM ELECTRIC, LTD., Nerston, East Kilbride, Glasgow.	" Mixmaster "	Small bowl, 2½ pint. Large bowl, 6 pint	Two bowl-fit beaters, two bowls	Mix-finder dial, automatic speed control, portable use	White, cream or green stoved enamel, black Bakelite mouldings. White, red or cream with golden trim (de-luxe)
	" Mixmaster " Junior	—	Two beaters, wall bracket	3-speed switch in handle	White stoved enamel, black Bakelite handle
VALMADE, LTD., Browells Lane, Feltham, Middlesex.	" Valmix "	3 pint	Two beaters	Portability	Cream, green or red
A. E. WARNER (LONDON), LTD., 56, Brewer Street, London, W.1.	" Turmix 450 "	1½ pint glass goblet 3½ pint metal goblets	Available as mixer, juice extractor, shredder or lemon squeezer	Automatic speed adjustment, 3,000, 8,000 or 12,000 r.p.m.	White



1

Price (excl. P.T.)	Purchase Tax	Price of Accessories (excl. P.T.)	Purchase Tax on Accessories
£14 10 0	£3 3 7	£1 1 0 juice extractor £4 0 0 power gear unit	£0 2 4 £0 8 9
£15 10 0	£3 8 0	£5 7 3 mincer £2 5 0 juice extractor	£0 11 9 £0 5 0
£18 1 6	£3 19 6	£30 1 6	£3 6 1
£14 12 6	£3 4 6	£9 13 6	£1 1 4
£6 4 0 £5 9 6 (mixer only)	£1 7 3 £1 4 0 (mixer only)	—	—
£7 10 0	£1 13 0	£0 13 6 coffee mill	£0 3 0
£22 12 6	£4 19 3	* See below	* See below
£7 6 0	£1 12 0	—	—
£9 16 10	£2 3 2	—	—
£13 2 5	£2 17 7	—	—
£18 7 6	£4 0 8	—	—
£6 19 4	£1 10 2	—	—
£16 3 3	£3 10 0	£4 19 0 gear box £6 13 5 mixing bowl	£1 2 4 gear box £1 8 11 mixing bowl
£14 10 0	£3 3 7	£1 1 0 juice extractor £4 0 0 power gear unit £2 5 0 mincer	£0 2 4 £0 8 9 £0 4 11
£16 15 8 £18 0 10 (de-luxe)	£3 13 8 £3 19 2 (de-luxe)	£5 3 4 blender £5 3 4 slicer and shredder £5 3 4 mincer £0 19 7 juice extractor	£0 11 4 £0 11 4 £0 11 4 £0 2 5
£9 2 6	£2 0 0	—	—
£5 12 0	£1 4 6	£0 12 6 mixer stand	£0 1 4
£32 10 0 (metal goblets £2 each extra)	£7 5 6	£3 10 0 lemon squeezer £5 10 0 juice extractor	£0 15 8 £1 4 0

FOREMOST in popularity among the range of electrical portable appliances for use in the kitchen is the food mixer. Originally designed to eliminate much of the hard work entailed in the preparation of meals, more especially the stirring of cake mixtures, it has now been developed into a machine with attachments for beating, mincing, mixing, shredding, potato peeling and, in fact, almost every kitchen task. One of the most recent additions to the wide range of attachments available for the Kenwood food mixer is a bean slicer and pea huller.

Apart from the larger type of machine there are several smaller portable ones obtainable. Newcomers to this market are Morphy-Richards, Ltd., who have recently introduced a neat portable mixer fitted with two interchangeable sets of paddles and whisks.

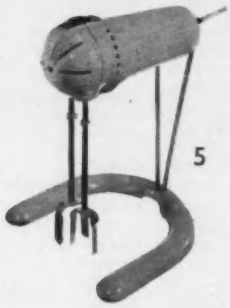
The food mixer is one of the appliances affected by the purchase tax reductions and prices are consequently lower than at this time last year.

2

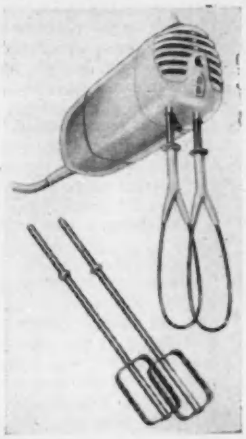
3

4

1. *English Electric "5500" food mixer with juicer attachment*
2. *Kenwood model A.700D "Chef"*
3. *Sunbeam "Mixmaster"*
4. *Midland Repetition "Rapide Mixstir"*
5. *Valmade portable mixer on stand*
6. *Morphy-Richards lightweight mixer*
7. *Siroma model "FM4A" mixer*



5



6

7

* Kenwood A.700D "Chef" accessories:—Juice extractor, £1 9s 3d (plus 3s 3d purchase tax); oil dripper, 3s 7d (5d); liquidiser, £4 7s 11d (9s 7d); mincer, £2 16s 4d (6s 2d); coffee mill, £4 5s 7d (9s 5d); colander and sieve, £2 3s 11d (1s 1d); slicer and shredder, £4 1s 1d (8s 11d); continuous high-speed slicer and shredder, £4 9s 8d (9s 10d); continuous juice separator, £5 13s 1d (12s 5d); adaptor, £3 11s 8d (7s 10d); potato peeler, £4 9s 8d (9s 10d); can opener, £1 17s 5d (4s 1d); bean slicer and pea huller, £2 4s 7d (4s 11d); glass bowl, £1 2s 6d (2s 6d); stainless steel bowl, £4 3s 4d (9s 2d); sausage filler, 2s 3d (3d).

Financial Section

STOCKS and SHARES

ACTIVITY in the industrial markets of the Stock Exchange was subdued a little by the interim report issued by Imperial Chemical Industries in respect of the first six months of this year. It came as a reminder that although the accent of Government policy is now upon re-expansion, the after-effects of the credit squeeze, coupled with the tendency for profit margins to contract, must be expected to persist long enough to influence the 1958 results of many companies. In the electrical markets, shares of the domestic equipment manufacturers have been less in the limelight, while there has been a noticeable quickening of interest in those of the cable manufacturers. Arising from the anticipation that the more stable behaviour of copper prices will relieve the industry from a repetition of the heavy stock losses of the two previous years, this movement was assisted by encouraging news from individual firms.

L.E.W. Interim

A rise in the price of London Electric Wire & Smiths 5s shares from 48s to 53s 9d followed the company's announcement of an interim dividend of 5 per cent on account of the present year. This is the first change to be made in the rate since a 100 per cent scrip issue was distributed in 1953. In each subsequent year an interim payment of 3¾ per cent has been followed by a final of 8¾ per cent, and the last total of 12½ per cent was covered about 2½ times by the earnings of 1957. The latter were considerably affected by the slump in the price of copper, which involved a stock depreciation of over £300,000. Nearly two-thirds of this was covered by a reserve fund, leaving the rest to be charged against profits. In the annual report issued last May, the chairman hoped that there would be no recurrence this year of a heavy charge on that score. No qualifying statement accompanied the declaration of the increased interim dividend, so that the market is encouraged to look for a larger total. On the basis of the 12½ per cent rate of dividend the yield on the shares is just under 4¾ per cent.

T.C. & M.

News from Montreal of the proposed global Commonwealth cable link, and of the $2½ million contract to Submarine Cables for the construction of a Canadian section, induced a further rise of 2s 9d, to 28s 9d, in the shares of Telegraph Construction and Maintenance, who own Submarine Cables jointly with Siemens Edison Swan, a member of the A.E.I. group. T.C. & M. shares had already improved considerably in value during previous weeks, partly in conformity with the general revival of interest in cable manufacturers' shares, and partly on the strength of the company's recently issued interim progress report. This showed that although the group's earnings in the first six months of this year had been below those of the corresponding half of 1957, the income from the company's trade investments for the full period was expected to be

Price Changes in

Company or Board	Nom. Value	Middle price 29th Sept.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1958 Highest	1958 Lowest
Gilt-edged Stocks								
Brit. Elec. 1968/73	100	76		3	3	3 19 0	76½	72
Brit. Elec. 1974/77	100	72½		3	3	4 2 9	73½	68½
Brit. Elec. 1976/79	100	78		3½	3½	4 9 9	78	72
Brit. Elec. 1974/79	100	86		4½	4½	4 18 9	87½	82½
Overseas Electric Supply								
Calcutta Elec.	£1	17/6		6·8†	7†	8 0 0†	17/6	15/-
East African Power	£1	22/6	+6d	7½	8	7 2 3	22/6	17/6
Nigerian Elec.	£1	15/-		10	10	13 6 9	17/-	12/6
Perak Hydro-Elec.	£1	15/-	—6d	10	12½	16 13 3	15/6	13/6
Electrical Shares								
Aberdare Holdings	5/-	13/3	—3d	17½	17½	6 12 0	13/9	9/9
Aerialite	1/-	8/-	+3d	48	51½	6 8 9	8/-	5/1
Allen, W. H.	£1	38/9	+1/6	10	11	5 13 6	38/9	32/9
Anglo-Portuguese Tel.	£1	29/3	+6d	8	9	6 3 0	29/3	19/9
Aron Elec. Ord.	£1	55/-		15	15	5 9 0	57/6	53/-
Assoc. Elec. Ord.	£1	52/6	—1/3	15	15	5 14 3	53/9	46/6
Automatic Tel. & El.	£1	70/-		17	17	4 17 3	70/-	57/-
Babcock & Wilcox	£1	50/6	+1/-	15	13‡	5 3 0	52/9	41/9
Bakelite	10/-	22/-	+6d	15	15	6 16 3	22/-	17/6
Baldwin, H. J.	2/-	2/9		20	20	—	3/9	2/6
Berry's Electric	5/-	7/9	—9d	10	10	6 9 0	8/6	5/9
British Aluminium	£1	47/6	—5/6	12	12	5 0 9	55/-	37/-
Brit. Elec. Traction: Def. Ord. "A"	5/-	31/-	+1/6	25	25	4 0 9	31/-	19/6
B.I. Callender's	£1	46/6	+1/6	12½	12½	5 7 6	47/-	38/9
B.I. Callender's 6% Pref. ...	£1	20/-		6	6	6 0 0	20/3	19/-
British Tabulating	£1	53/9	+2/-	9	10	3 14 6	53/9	38/6
British Thermostat	5/-	32/-	+9d	25	30	4 13 9	32/-	19/9
British Vac. Cleaner	5/-	8/-	—3d	10	10	6 5 0	8/3	4/6
Brook Motors	10/-	42/6		25	25	5 17 9	42/6	33/3
Bulgin, A. F.	1/-	6/3	+6d	40	45	7 4 0	6/3	4/7
Bulpitts	5/-	8/9		—	12½‡	7 2 9	8/3	7/3
Burco Dean	5/-	9/9	—3d	20	22½	7 13 9*	10/-	7/9
Cable & Wireless: Ord.	5/-	11/9	—3d	10	10‡*	4 5 0	12/-	8/-
4% Loan	100	94		4	4	4 5 0	94½	89
Chloride El. Storage "A" ...	£1	63/-	+1/-	17½	17½	5 11 0	63/-	55/6
Clarke Chapman	£1	63/9		27½	27½	4 6 3*	72/6	55/-
Cole, E. K....	5/-	17/-		17½	17½	5 3 0	18/-	15/3
Cossor, A. C.	5/-	5/-	—3d	2½	Nil	Nil	6/-	4/4
Crabtree	10/-	30/-	+6d	20	20	6 13 3	30/-	24/4
Crompton Parkinson Ord. ...	5/-	11/9	+3d	16	16	4 10 9*	12/-	8/3
De La Rue	10/-	25/6	+6d	35	17½*	6 17 3	26/3	20/9
Decca "A"	4/-	29/3		43¾	43¾	5 19 9	29/3	21/3
Desoutter	5/-	16/6		32½	18¾*	5 13 9	16/6	13/6
Dewhurst	2/-	8/6	+3d	16½	20	4 14 3	8/6	6/9
Dictograph Tel.	2/-	7/-		20	20*	5 14 3	7/-	4/7
Dubilier Condenser	1/-	3/6		30	20*	5 14 3	4/3	3/1
Duport	5/-	9/9	+3d	25	25	6 8 3*	9/9	7/9
E.M.I.	10/-	41/-	+9d	15	15	3 13 3	41/-	27/6
Electrical Components	5/-	9/-		12½	12½	6 19 0	9/-	7/-
Elec. Construction	£1	26/3		8½	8½	6 9 6	26/3	21/-
Elliott-Automation	5/-	16/9		—	10‡	2 19 9	17/-	11/6
Enfield Cable Ord.	£1	16/-	—6d	Nil	2½	3 2 6	17/-	10/9
English Electric	£1	58/9		14	14	4 15 3	58/9	44/-
English Electric 3½% Pref. ...	£1	12/6		3½	3½	6 0 0	12/6	11/9
Ericsson Tel.	5/-	24/3		22†	12*†	2 9 6†	24/3	17/6
Ever Ready	5/-	20/-		37½	20*	5 0 0	19/6	13/9
Falk Stadelmann	£1	38/9		17½	17½	9 0 9	38/9	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

more than double the previous figure of £95,000.

Rise in Cable Shares

While the movements noted above in Telegraph Construction and L.E.W. shares were induced in part by items of individual news, others in the cable group were supported on the more general considerations about the outlook for the industry. Among them, B.I.C.C. were marked up by a further 1s 6d, to 46s 6d; and there was a further revival of interest in the shares of W. T. Henley's Telegraph Works and Johnson and Phillips, who recently announced the termination of discussions on a possible agreement between the two firms. W. T. Henley's shares retained the previous week's sharp rise to 14s 3d, and were dealt in up to 15s, while J. & P. gained 2s to £1. Enfield Cables were a little reactionary after their earlier advances, but Aerialite were again in demand, up to 8s.

Electrical Investments

Company or Board	Nom. Value	Middle price 29th Sept.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1958 Highest	1958 Lowest
Electrical Shares—continued						£ s d		
G.E.C. Ord.	£1	37/6		12½	10	5 6 9	38/9	29/3
G.E.C. 6½% Pref.	£1	21/-		6½	6½	6 3 9	21/3	20/3
General Cables	5/-	9/3	+6d	30	24	—	11/9	8/3
Greenwood & Batley	£1	50/6		17½	20	7 18 6	50/6	45/-
Hackbridge Holdings	5/-	13/3		20	20	7 11 0	14/3	7/6
Hackbridge & Hewittic	5/-	13/9		20	20	7 5 6	13/9	9/7
Head Wrightson	5/-	21/9		22½	17½*	4 0 6	22/3	16/9
Heatrae	2/-	7/-		15	20	5 14 3	7/-	4/-
Henley's	10/-	14/3		11½	11½	8 1 6	14/6	10/6
Holophane	5/-	14/9		30	37½	7 12 6*	14/9	12/6
Hoover	5/-	49/6	+6d	50	50	5 1 0	49/6	31/-
I.C.I.	£1	33/6	—1/6	10	12	4 15 6*	35/-	23/9
Intl. Combustion	5/-	27/6		22½	25	4 11 0	27/6	19/3
Johnson & Phillips	£1	20/-	+2/-	10	5	5 0 0	25/-	15/-
Lancashire Dynamo	£1	40/-	+1/3	11	11	5 10 0	40/-	28/6
Laurence Scott	5/-	16/3	—6d	15	15	4 12 3	16/9	12/6
Lister, R. A.	£1	27/6		10	10	7 5 6	27/6	23/-
London Elec. Wire	£1	53/9	+5/9	12½	12½	4 13 0	53/9	39/6
Lucas, J.	£1	39/6	—6d	7½	7½	3 16 0	40/-	27/9
Marconi Marine	£1	35/-		10	10	5 14 3	35/-	29/-
Marryat & Scott	2/-	7/6		35	37½	5 0 0*	7/6	5/3
Mather & Platt	£1	42/6	+3/3	15	15	4 14 3*	42/6	29/6
Metal Industries	£1	40/-	+1/9	9	14	7 0 0	40/6	22/9
Midland Elec. Mfg.	£1	50/-	+2/6	12½	12½	5 0 0	50/-	44/-
Morphy-Richards	4/-	18/-	—9d	50	20*	4 9 0	19/-	14/6
Murex	£1	49/-	—1/-	20	17½	7 2 9	58/3	48/-
Newman Ind.	2/-	2/3		10	10	8 17 9	2/9	2/3
Oldham & Son	1/-	3/-		17½	17½	5 16 9	3/-	2/3
Parnall (Yate)	5/-	17/6		12	12	3 8 6	17/6	5/9
Parsons, C. A.	£1	48/9		8½	7½*	3 1 6	53/6	43/-
Plessey	10/-	63/3		30	30	4 14 9	64/-	55/-
Pye "A" Deferred	5/-	13/6		12½	12½	4 12 6	14/6	10/-
Reyrolle	£1	80/-		17½	17½	4 7 6	84/6	73/6
Rheostatic	4/-	7/-		12½	12½	7 2 9	8/-	6/-
Richardsons Westgarth	10/-	15/9	+6d	16½	8½*	5 5 9	15/9	13/-
Scottish Cables	4/-	11/3		27½	27½	5 13 9*	11/3	7/-
Simon-Carves	5/-	27/6		20	25	4 11 0	28/9	22/6
Smith (England), S.	4/-	10/-		17½	20	4 0 0*	10/-	7/-
Southern Areas	£1	12/9		7½	Nil	Nil	13/9	9/3
Strand Elec.	5/-	7/9		15	15	9 13 6	7/9	4/9
Sturtevant	5/-	15/9		15†	15†	4 15 3†	18/-	14/9
Sun Elec.	£1	60/-		25	25	9 2 0	60/-	47/3
Switchgear & Cowans	5/-	16/9		25	22½	6 14 3	16/9	8/9
Taylor Tunnicliff	5/-	15/3		15	17½	5 14 9	15/3	11/9
T.C.C.	10/-	35/-		25	25	7 2 9	38/6	32/6
T.C. & M.	£1	28/9	+2/9	8½	8½‡	5 18 3	29/-	20/-
Telephone Mfg.	5/-	5/6	+3d	10	10	9 1 9	5/6	4/6
Telephone Rentals	5/-	12/3		12½	12½	5 2 0	13/6	9/9
Thompson (John)	5/-	25/-		25	25	5 0 0	27/-	23/-
Thorn Elec. "A"	5/-	21/3		17½	17½	4 2 3	23/3	17/-
Thornycroft	£1	30/-	+2/6	12½	12½	8 6 9	30/-	21/-
Tube Investments	£1	61/3	—1/3	13¾	15	4 18 0	62/6	48/3
Vactric	5/-	26/-		25	25	4 16 3	26/6	14/3
Veritys	5/-	5/3		12½	2½	2 7 6	6/9	5/3
Walsall Conduits	4/-	16/3	+6d	20	22½	5 10 9	16/3	11/-
Ward & Goldstone	5/-	30/-		40	25*	4 3 3	30/6	23/6
Watford	2/-	7/-	+3d	25	25	5 14 3*	7/6	5/-
Westinghouse	£1	40/-		18	10*	5 0 0	40/-	32/3
West, Allen	5/-	13/3		15	12½*	4 14 3	13/6	9/3
Wolf Electric	5/-	7/9		20	10*	6 9 0	9/-	6/9

Price Changes

Several electrical shares again moved up to their highest prices of the year during the past week or so. Among these were Crabtree Electrical and Dewhurst and Partner. The former company's results for the year ended in July are expected to appear towards the end of this month, and those of Dewhurst and Partner, who close their books in September, about a month later. Best prices of the year were marked in Midland Electric Manufacturing at 50s, Mather and Platt at 42s 6d, Chloride Electrical at 63s, British Thermostat at 32s and A. F. Bulgin at 6s 3d. Morphy-Richards turned easier, at 18s, in advance of the final dividend declaration.

Company News

Vactric 5s shares remained little changed, at around 26s, after the latest news about the sale of the hire-purchase subsidiary to Lombard Banking. The cash consideration of £1·65 million, it is disclosed, results in a profit to Vactric of a little over a million, of which £765,000 is to be distributed to shareholders in the form of an interim dividend of 8s 6d per share, tax-free. Metal Industries £1 shares have again risen strongly, to 40s, since the announcement of the acquisition of another subsidiary. The company raised over £2 million by the recent sale of its investment in British Oxygen, and is engaged on a policy of widening and diversifying the basis of the business. Efco 10s shares have remained firm at 28s 6d since the annual meeting and the announcement of an agreement for the formation of a new company in association with Birlec, Ltd., one of A.E.I.'s subsidiaries.

Pye Meeting

A scheme outlined by the chairman at the Pye annual meeting for the consolidation of the company's deferred stock and the "A" deferred stock was well received in the City, which has become increasingly opposed to the issue of shares carrying no voting rights. Mr. C. O. Stanley confirmed that Pye held a 9 per cent interest in the equity of Associated Television, and another of the group's investments to receive favourable mention was the holding of shares in British Relay Wireless and Television. Of the outlook, the chairman described profits as having become harder to earn, but in the more difficult conditions he expected Pye at least to maintain its relative position in the industry.

REPORTS and DIVIDENDS

Hartley Baird, Ltd.—The accounts for the year to 30th April last show a group profit, before taxation, of £50,319, as compared with £5,770 for the preceding year, and after providing for taxation, the net balance is £5,807 (against a loss of £75,071). After deducting the dividends paid on the preference capital in respect of the six months ended 30th June, 1957, there is a net surplus of £57. The deficit brought in is £32,393, leaving a consolidated debit balance of £32,336 to be carried forward.

In his circulated statement, Mr. C. Collaro (chairman) says that the group parent company, Camp Bird, Ltd., has agreed to introduce new capital amounting to £190,500 by taking up Hartley Baird ordinary shares at par (1s per share) in the immediate future. Hartley Baird has acquired a major interest in H. J. Baldwin, Ltd. Photo Printed Circuits, Ltd., was disposed of during the year but only at the expense of a further loss for the year. Mr. Collaro refers to the success of new products. At the Duratube & Wire factory new plant of a major nature has been recently added.

Peerless & Ericsson, Ltd., has received an offer made by Hambros Bank on behalf of Smaden Investments, a company controlled by Mr. K. M. Wood, managing director of the Kenwood Manufacturing Co., Ltd., for its preference and ordinary capital. In recommending acceptance of the offer, which is 8s 6d per £1 preference stock and 1s 6d per 5s ordinary stock, the directors state that in a liquidation the amount available to stockholders might well be less than the £165,300 now offered for the capital. Another reason for recommendation is that an earlier share exchange offer equivalent to £150,000 at market prices, was withdrawn and the board was informed that it would not be increased. It is also stated that although the current position shows improvement, the board's opinion is that, unless additional finance is introduced into the business, probably involving a writing down of capital, future profits are unlikely to be sufficient to wipe off the £134,581 deficit for some time to come. The offer is conditional upon not less than 90 per cent acceptance by both classes by 14th October, or such lesser percentage as Smaden Investments may agree to accept. If the offer becomes unconditional Mr. W. F. Hammond (chairman) and Mr. K. E. D. Watkins will resign as directors of Peerless & Ericsson and its subsidiaries, receiving as compensation £3,000—the equivalent of two years' directors' fees.

Vactric, Ltd.—The sale of the whole of the share capital of the Awley Finance Co., Ltd., to Lombard Banking, Ltd., was completed on 26th September, resulting in a capital profit to Vactric, Ltd., of approximately £1,050,000. An extraordinary general meeting of Vactric will be convened forthwith to effect minor amendments to the memorandum and Articles of Association of the company, and immediately after the conclusion of that meeting the board intends to pay out of this capital profit the sum of £765,000 by way of an interim dividend of 8s 6d in respect of each of the ordinary and "A" (non-voting) ordinary shares in the capital of the company.

The London Electric Wire Co. & Smiths, Ltd., is paying an interim dividend of 5 per cent (against 3¾ per cent).

The Sturtevant Engineering Co., Ltd., has declared an interim dividend of 3 per cent, tax free (unchanged).

The Superheater Co., Ltd., has announced an interim dividend of 5⅝ per cent (against 10 per cent), on doubled capital.

The British Aluminium Co., Ltd., has declared an interim dividend of 4 per cent (unchanged) on increased capital.

T. Clarke & Co., Ltd., are paying an interim dividend of 8 per cent (unchanged).

The Telephone & General Trust, Ltd., has announced an interim dividend of 5 per cent (unchanged).

New Companies

Tanner Electrical, Ltd.—Registered 1st September. Capital £100. Manufacturers of and dealers in electrical goods of all kinds, etc. Directors: J. E. W. Tanner and Eileen E. E. Tanner (secretary). Regd. office: 12, Bury Place, Bloomsbury, W.C.1.

O. M. Williams (Electrical Engineers), Ltd.—Registered 29th August. Capital £2,000. Television and radio engineers, electricians, electrical engineers, etc. Directors: O. M. Williams and W. R. Williams (secretary). Regd. office: Sunnydale, Half Way House, near Shrewsbury.

K. J. Radio Television & Electrical Co., Ltd.—Registered 1st September. Capital £1,000. Electrical engineers and general electrical and refrigeration installation contractors, manufacturers of and dealers in radio and television sets, gramophones, etc. Directors: K. Jones and Mrs. Ivy Jones. Solicitors: Band Hatton & Co., Coventry.

Target Tubes, Ltd.—Registered 24th July. Capital £100. Manufacturers, distributors, exporters and importers of and dealers in all kinds of electrical and electronic equipment, apparatus and appliances, radio and television receivers and transmitters, etc. Directors: J. B. Frank and S. Smith. Regd. office: 20, St. Petersgate, Stockport.

Re-Gun Electronics, Ltd.—Registered 28th July. Capital £100. Manufacturers, contractors and distributors of, agents for, wholesale and retail dealers in electrical goods of all kinds, radio and television sets, etc. Directors: L. Dunn, M. R. Lawrence, E. J. Ellson and C. Gould. Regd. office: 76, New Oxford Street, W.C.1.

Merchandise Factors, Ltd.—Registered 15th August. Capital £1,000. Manufacturers, importers and exporters of, agents for, wholesale and retail dealers in and hirers out and repairers of electrical goods of all kinds, radio and television receivers and accessories, etc. Directors: L. H. Nash and R. A. Nash. Regd. office: 7, Gt. Winchester Street, E.C.2.

Gellygaer Electrical Services, Ltd. Registered 11th August. Capital £2,000. To acquire the business of electrical retailers and contractors carried on by A. G. Matthews and Margaret J. Matthews at 32-3, Cardiff Road, Bargoed, etc. Directors: A. G. Matthews, Margaret J. Matthews and G. Jones. Reg. office: 32-3, Cardiff Road, Bargoed, Glam.

Billingham (Electrical), Ltd.—Registered 1st August. Capital £2,000. Manufacturers of and dealers in electrical goods of all kinds, etc. Directors: F. W. T. Billingham and T. H. Moore. Regd. office: 152, Yarningale Road, Kings Heath, Birmingham, 14.

Kelly Electric Service Co., Ltd.—Registered 5th August. Capital £1,000. Electrical engineers and general electrical installation contractors, radio and television engineers, etc. Directors: J. P. Kelly and Mrs. Ann V. Kelly. Regd. office: 2, Ashwood Avenue, Coventry.

Gemlectric Appliances, Ltd.—Registered 14th August. Capital £1,500. Manufacturers of and dealers in electric blankets, carpets, felts, toasters, irons, etc. Directors: L. C. Baxter and E. G. Lennard. Regd. office: 11, Old Bond Street, W.1.

Faith Electrics, Ltd.—Registered 14th August. Capital £1,000. Dealers in and salesmen, demonstrators, maintainers and repairers of electrical, mechanical and household equipment, etc. Directors: F. L. Seaborne, Faith M. E. Seaborne and J. A. Smith, jnr. Regd. office: 165, Strand, W.C.2.

Modern Electrical (Appliances), Ltd.—Registered 13th August. Capital £100. Electricians, mechanical engineers, manufacturers and workers of and dealers in electrical apparatus and goods, etc. Directors: C. Taylor and Mrs. Phyllis Taylor. Regd. office: 18, Wheathouse Road, Birkby, Huddersfield.

Electrical & Marine Instrument Co., Ltd. Registered 8th August. Capital £1,000. Designers, manufacturers, patentees, licensees and repairers of and wholesale and retail dealers in electronic and other automation and scientific and industrial instruments, including radio and television, etc. Directors: R. J. Hardwick and Mrs. Nita Hardwick. Reg. office: 320, Foleshill Road, Coventry.

Supreme Washing Machines (Horsham), Ltd.—Registered 27th August. Capital £1,000. Proprietors, preparers for use and letters on hire of electric washing machines, etc. Permanent directors: F. G. Ranson and W. T. Looker. Secretary: Joan M. Looker. Regd. office: 3, Queen Street, Horsham, Sussex.

Miles Hivolt, Ltd.—Registered 3rd September. Capital £100. Electrical, electronic, nucleonic, atomic, mechanical, chemical and general engineers and contractors, manufacturers of and dealers in high voltage generators, etc. Solicitors: Theodore Goddard and Co., 5, New Court, W.C.2.

Charles Morris & Sons (Barnstaple), Ltd.—Registered 4th September. Capital £6,000. To acquire the business of an electrical, radio and television engineer now carried on by F. G. Smallridge at 74, Newport Road, Barnstaple, as F. G. Smallridge & Son. Directors: C. Morris, H. S. Morris and C. N. Morris. Solicitors: T. A. Godman & Wright, Bideford.

Increase of Capital

W. J. Furse & Co. (Manchester), Ltd.—Increased by £90,000, in £1 ordinary shares, beyond the registered capital of £30,000.

Bankruptcies

T. T. Forrest, formerly carrying on business at 4-6, New Shambles, Kendal, Westmorland, as an electrical engineer.—Trustee, Mr. D. Atkinson, 14, Lowther Street, Carlisle, Official Receiver, released 17th September.

N. W. Ives, North Street, Burnham Market, Norfolk, radio, cycle and electrical engineer.—Trustee, Mr. F. R. D. Walter, Castle Chambers, Opie Street, Norwich, Official Receiver, released 17th September.

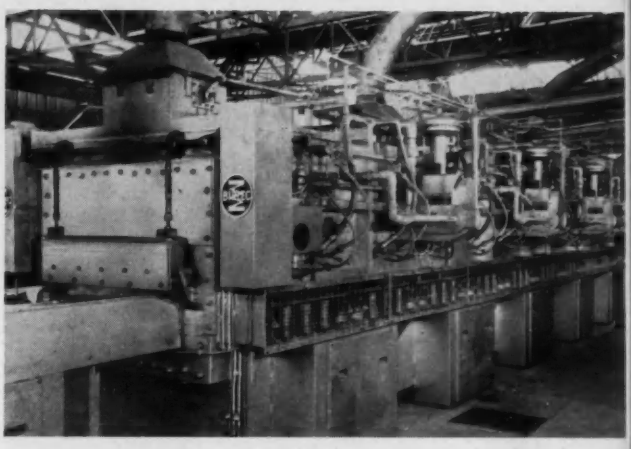
Remote Furnace Control

AN electronic control system is incorporated in the gas-fired, roller hearth annealing furnace recently installed by Birlec, Ltd., in the new stainless steel mill of Talbot Stead Tube, Ltd., Walsall. The furnace has a capacity of one ton of steel per hour and comprises four sections, a loading table, furnace chamber, spray quench booth and unloading table, the hearth of each section consisting of a series of chain-driven rollers enabling tubes up to 40ft long and 8in diameter to be carried completely through all four sections. The furnace is automatically controlled during continuous or batch production, and the three control desks situated along its length were manufactured by Teledictor, Ltd., who also designed and constructed the electronic counting equipment and other apparatus.

Three driving motors are fitted, connected by Warner electromagnetic clutches and brakes to the roller shafts of the various sections. The main 12½ h.p. motor can drive the rollers in any of the four sections, whilst a 1 h.p., 1,440 r.p.m. motor with a 120:1 reduction gear and a 30 h.p., 940 r.p.m. motor can be connected to the furnace chamber rollers and rollers of the third and fourth sections respectively. The 1 h.p. motor is reversible, rotating the furnace hearth rollers in either direction, thus moving the tubes to avoid distortion during the heating process, and the 30 h.p. motor is connected when it is required to drive the spray quench booth and unloading table rollers at high speed.

A high starting torque characteristic is required, falling by approximately 50 per cent once the rollers begin to revolve, and to obtain this while preventing the hearth rollers skidding and scoring the tubes an electronic closed loop servo system for the main drive and high-speed drive clutches is installed. All the other clutches revolve at very low speeds and are controlled by pre-set potentiometers to give the optimum driving torque and protect the driving chains.

For continuous operation the clutches of each of the four sections are engaged, the main motor driving all the rollers, and tubes pass through continually. During batch production tubes are placed on the loading table and driven into the furnace chamber by engaging the main drive clutch and the furnace clutch.



Birlec roller hearth annealing furnace in the stainless steel mill of Talbot Stead Tube, Ltd., Walsall

When the tubes have moved into the furnace, an electronic counter stops the drive and the 1 h.p. motor clutch is engaged, causing the furnace rollers to be turned in the forward and reverse directions for a predetermined time. The 30 h.p. high-speed motor starts after the correct time has elapsed, for rapid transfer of the tubes from the furnace to the quenching section. The counting equipment operates as before to stop the drive when the tubes are in the correct position for quenching, and a second batch of tubes on the loading table are then driven into the furnace chamber.

Normally, the load is accelerated to full speed in between five and ten seconds, moved to a position just short of the required distance and decelerated to a very low speed, at which it moves forward to its final position. All the speed variation is obtained by control of the electromagnetic clutches and brakes, manufactured by Westool, Ltd.

Fuel and Power Conference

A THREE-DAY conference on "Fuel and Power in British Industry," arranged by the Manchester Joint Research Council, will be held at the Manchester College of Science and Technology, Sackville Street, Manchester, from 5th to 7th November. The conference is intended to assist business executives in the planning of industrial developments. Each of the major fuels or sources of power will be considered by men able to assess the position not only as it is at the moment, but also as it may be expected to appear a decade or two hence, from the point of view of the resources available, their supply and utilisation.

The conference will be opened by Lord Mills, Minister of Power. The first session will deal with oil, the second with coal and the third with gas and nuclear power. Sir Leonard Owen (managing director, Industrial Group Headquarters, United Kingdom Atomic Energy Authority), will speak on nuclear power, and the discussion will be opened by Mr. J. B. W. Cunningham (also of the U.K.A.E.A.).

The final session on 7th November will deal with electricity as a source of power and the speakers will be Mr. A. O. Johnson (chief commercial officer, North Western Electricity Board), and Mr. T. E. Daniel (chairman, North Western Electricity Board). The discussion will be opened by Mr. H. West (managing director, A.E.I.-John Thompson Nuclear Energy Co., Ltd.). Finally, there will be a discussion on the future trends of fuel and power.

The fee for the conference (which includes a buffet luncheon on the second day) is two guineas. Applications should be made by 6th October to the joint hon. secretaries, Manchester Joint Research Council, c/o Manchester Chamber of Commerce, P.O. Box 559, Manchester, 2, from whom further information can be obtained.

Coal-Electric Water Heating

A recent Electrical Research Association report, Ref. Y/T14, "The Effect on Electricity Consumption of the Layout of Coal-Electric Water-Heating Systems," by M. V. Griffith, describes an investigation to determine how the danger, arising from the insertion of an electric immersion heater and thermostat into a hot-water storage tank normally supplied by a coke- or coal-fired boiler, of electrically-heated water circulating downwards from the tank and through the boiler during the summer months might be reduced by proper design of the pipework. The investigation was also to provide data as to the actual energy loss occurring in certain circumstances. The efficacy of recommendations already made for eliminating or reducing this fortuitous and unwanted circulation is studied and suggestions made.

Copies of the report, price 12s, are obtainable from the E.R.A. at Cleeve Road, Leatherhead, Surrey.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1954

31096. Harris & Sheldon (Electrical), Ltd.—Light diffusing devices, particularly for use in connection with fluorescent lighting. 20th October, 1955. (802204.) 31097. Suspension means for light diffusing devices, particularly for use in connection with fluorescent lighting. 20th October, 1955. (802205.)

31663. Pye, Ltd. — Transistors and methods of producing same. 24th October, 1955. (802262.)

34822. Robertshaw-Fulton Controls Co.—Electric control devices. 1st December, 1954. (802391.)

1955

266. Rank-Xerox, Ltd.—Processes and apparatus for rendering electrostatic images visible. 29th March, 1956. (Addition to 723539.) (802151.)

849. Laboratory for Electronics, Inc.—Magnetic shift registers. 11th January, 1955. (802152.)

1641. Cabelka, J., and Horvath, S.—Coated metal electrodes for electric arc welding and method of their manufacture. 19th January, 1955. (802392.)

2637. Igranic Electric Co., Ltd.—Means for reducing or nullifying the minimum output current of magnetic amplifiers. 28th January, 1955. (802209.)

15827. Igranic Electric Co., Ltd.—Temperature responsive electric circuit controlling devices. 2nd June, 1955. (802159.)

18183. Clevite Corporation. Transducer head for magnetic recording/reproducing apparatus. 23rd June, 1955. (802395.)

18336. Philips Electrical Industries, Ltd.—Cathode-ray tubes. 24th June, 1955. (802103.)

19032. Simplex Electric Co., Ltd.—Means for controlling the power dissipation in electric heaters. 2nd August, 1956. (802372.)

19398. Marconi's Wireless Telegraph Co., Ltd.—Pulse radar systems. 9th May, 1956. (802373.)

27000. General Electric Co.—Transistor oscillator circuits. 21st September, 1955. (802104.)

27183. International Business Machines Corporation.—Point contact transistors. 23rd September, 1955. (802331.)

27252. General Electric Co., Ltd.—Heat-exchangers. 24th September, 1956. (802271.)

28392. Self-Changing Gears, Ltd.—Electrical means for automatically controlling change-speed gearing. 4th January, 1957. (802272.)

28547. Wipac Development, Ltd.—Lighting circuit for motor cycles and the like. 25th September, 1956. (802249.)

36646. Philco Corporation.—Neutralised amplifiers. 21st December, 1955. (802107.)

1956

1971. Rank Cintel, Ltd.—Electron guns for cathode-ray tubes. 21st January, 1957. (802108.)

2763. Babcock & Wilcox, Ltd.—Tubulous steam boilers. 25th January, 1957. (802173.)

4222. Marconi's Wireless Telegraph Co., Ltd.—Electrically heated thermostatically controllable containers. 24th October, 1956. (802333.)

6170. Philips Electrical Industries, Ltd.—Radio telegraphic transmission systems. 28th February, 1956. (802402.)

6368. Air Reduction Co., Inc.—Method and apparatus for electric arc welding. 29th February, 1956. (802377.)

6446. Babcock & Wilcox, Ltd.—Nuclear reactor fuel element handling plant. 27th February, 1957. (802285.)

6605. Standard Telephones & Cables, Ltd.—Railway signalling equipment. 2nd March, 1956. (802088.)

6904. National Research Development Corporation.—Electrical digital computing engines. 4th March, 1957. (802175.)

7368. Birlec, Ltd.—Electric furnaces. 11th March, 1957. (Addition to 718858.) (802287.)

8381. Napier & Son, Ltd., D.—Electric batteries. 15th March, 1957. (802125.)

8672. British Thomson-Houston Co.—Electrical apparatus embedded in cast insulation. 21st February, 1957. (802177.)

9754. Svenska Ackumulator Aktiebolaget Jungner.—Hermetically closed electric storage cells. 28th March, 1956. (802379.)

10425. Westinghouse Electric International Co.—Alternating current generator systems. 5th April, 1956. (802180.)

10652. Standard Telephones & Cables, Ltd.—Manufacture of ferro-magnetic cores. 5th April, 1957. (802380.)

12088. Mallory & Co., Inc., P. R.—Electrolytic capacitors. 20th April, 1956. (802383.)

13494. Westinghouse Electric International Co.—Electric motor control systems. 2nd May, 1956. (802184.)

18035. Siemens-Schuckertwerke Akt.-Ges.—Electric measuring instruments for alternating-current quantities. 11th June, 1956. (802214.)

19106. General Electric Co.—Squirrel cage rotor a.c. induction motors. 20th June, 1956. (802385.)

21901. National Cash Register Co.—Electrical apparatus for use in controlling the composition of data to be read out seriatim during a read out routine from a data storage device to an output device. 16th July, 1956. (802188.)

22056. Apra Precipitator Corporation.—Purge cycles for electrostatic precipitators. 17th July, 1956. (802130.)

22487. Standard Telephones & Cables, Ltd. — Automatic teleprinter exchange systems. 20th July, 1956. (802131.)

24973. AMP, Inc.—Insulated electrical connector. 15th August, 1956. (802132.)

29915. United-Carr Fastener Corporation.—Holders for electric lamp bulbs. 1st October, 1956. (802300.)

30489. Chempump Corporation.—Electric motor driven pumps. 5th October, 1956. (802301.)

31749. Telefonaktiebolaget L. M. Ericsson.—Control devices responsive to the attraction by an electromagnet of the armature thereof. 18th October, 1956. (802409.)

31876. Standard Telephones & Cables, Ltd.—Circuit for reducing the effect of delay distortion of amplifier systems on angularly modulated waves. 19th October, 1956. (802218.)

33595. Schaffler-Glossl, H., and Schaffler-Glossl, J. (trading as Schaffler & Co.).—Contacting device for dynamo-electrical igniting machines. 2nd November, 1956. (802303.)

35283. Western Electric Co., Inc.—Pulse counting circuits. 19th November, 1956. (802196.)

37151. Westinghouse Electric International Co.—Control systems for electric circuit-breakers. 5th December, 1956. (802197.) 37152. Memory elements for control systems. 5th December, 1956. (802412.)

37949. Forges et Ateliers de Constructions Electriques de Jeumont.—Train control and cab-signalling apparatus. 12th December, 1956. (802413.)

38291. Standard Telephones & Cables, Ltd.—Radio beacon transmitter. 14th December, 1956. (802258.)

38677. Philco Corporation.—Electrical circuits utilising transistors. 19th December, 1956. (802307.)

1957

4767. Philips Electrical Industries, Ltd.—Line deflection circuit arrangements for television receivers. 12th February, 1957. (802416.)

5259. Compagnie des Machines Bull.—Synchronising device for use in electronic calculators. 15th February, 1957. (802312.)

13248. Cable Makers Australia Proprietary, Ltd.—Moisture excluding means for electrical cable or cord connectors of the plug and socket type. 25th April, 1957. (802320.)

14923. Standard Telephones & Cables, Ltd.—Electrical counting equipment. 10th May, 1957. (802419.)

17795. Siemens & Halske Akt.-Ges.—Transmitters linearised by negative feedback. 4th June, 1957. (802230.)

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 10th October:—

BUSCH (design). No. 757,647. Class 9. Switches, sockets, combined switches and sockets, plugs and fuses, all being electric; push buttons for bells; and parts. BUSCH (design). No. 771,100. Class 11. Shadeholders and lampholders, all being electric lighting fittings. BUSCH (design). No. 771,101. Class 17. Electric insulators.—Busch-Jaeger Dürener Metallwerke Akt.-Ges., Lüdenscheid, Westphalia, Germany. Address for service, c/o D. Young & Co., 10, Staple Inn, London, W.C.1.

No. 769,873 (design). Class 9. Electrically operated signalling apparatus and parts.—Cotterill-Ginn, Ltd., 13, Suffolk Street, London, S.W.1.

CAMLOCK. No. 771,610. Class 9. Electric conduits and parts.—Salamandre Metal Works, Ltd., 90-92, Charlotte Street, Tottenham Court Road, London, W.1.

SEPCIL. No. 775,200. Class 9. Electric batteries.—Diamond (B.E.P.), Ltd., Star Chemical Works, Watts Grove, Bromley-by-Bow, London, E.3.

UNOCAST. No. B775,366. Class 9. Welding electrodes.—Metafol (London), Ltd., 70, Finsbury Pavement, London, E.C.2.

No. 776,383 (design). Class 9. Electric transformers, choke coils, performed laminations of common metal being parts of transformers and electro-magnetic instruments and apparatus.—Hinchley Engineering Co., Ltd., Pans Lane, Devizes, Wilts.

TRIMPOT. No. 777,065. Class 9. Electric potentiometers and variable electric resistances.—Bourns Laboratories, Inc., Riverside, Cal., U.S.A. Address for service, c/o R. F. Cowling & Co., Bank Chambers, 329, High Holborn, London, W.C.1.

ORIOLE. No. 776,870. Class 9. Electronic apparatus and instruments; radio, television, sound recording apparatus; parts; and sound records.—Oriole Records, Ltd., 119, Bishopsgate, London, E.C.2.

RADARMED. No. 777,212. Class 10. Electrical apparatus for radio-therapy; and hearing aids for the deaf.—Deutsche Elektronik G.m.b.H., Berlin-Wilmersdorf, Germany. Address for service, c/o W. P. Thompson & Co., 12, Church Street, Liverpool.

BROTHER. No. 777,242. Class 11. Electric fans, refrigeration installations and apparatus, air conditioning installations, and parts.—Brother International Corporation, New York, U.S.A. Address for service, c/o Joseph Harris & Co., 63, East Walk, East Barnet, Herts.

CENTRIFAX. No. 777,795. Class 11. Electric ventilation fans.—London Fan & Motor Co., Ltd., 27, Brecknock Road, London, N.7.

WE SPECIALIZE IN UNIT VENTILATION...

LONDON
9, Victoria Street,
London, S.W.1.
Telephone: ABBey 6441

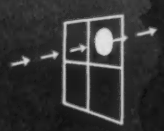
GLASGOW
135, Bath Street,
Glasgow, C.2.
Telephone: CITy 4944

MANCHESTER
58-60, Barton Arcade,
Manchester, 3.
Telephone: Blackfriars 0456

Vent-Axia

BRANCHES IN THE UNITED KINGDOM

AGENCIES THROUGHOUT THE WORLD



BIRMINGHAM
152, Steelhouse Lane,
Birmingham, 4.
Telephone: Central 1491

NEWCASTLE
42, Jesmond Road,
Newcastle-upon-Tyne, 2.
Telephone: Newcastle 813391

LEEDS
Britannia House, Wellington Street,
Leeds, 1.
Telephone: Leeds 22226

BRISTOL
Brunel House, St. George's Road,
Bristol, 1.
Telephone: Bristol 27567

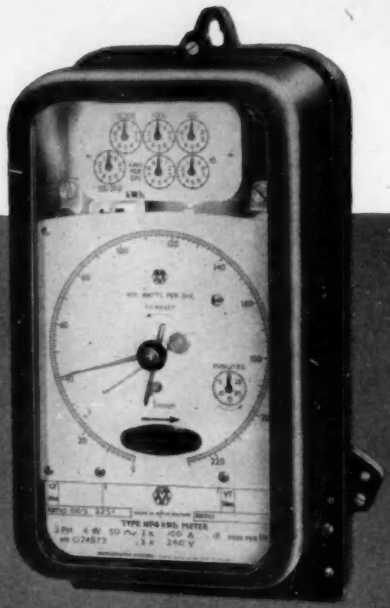
... and invite you to make use of our free technical service

Accent on Accuracy

WITH THE TYPE NF SERIES

The type NF3 (two-element) and NF4 (three-element) watt-hour and maximum demand meters have been designed to meet present day requirements for overall accuracy. Their easily accessible adjustments, lightweight construction and handsome appearance, will commend themselves to all users. The meters comply in all respects with British Standard 37: Part 4: 1954 and Part 5: 1955.

Type NF3 two-element watt-hour meter



Type NF4 three-element maximum demand meter

For further information please write for 'The Art of Metering', which gives full details of these meters.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

An A.E.I. Company

LEADING METERING PROGRESS

G/A 801

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 6th October

BOLTON.—Railway Hotel, Trinity Street, 7.45 p.m. A.S.E.E. Bolton Branch. A.S.E.E. 1957 Exhibition film.

CAMBRIDGE.—Technical College, 6.30 p.m. I.E.E. East Anglian Sub-Centre. Chairman's address, by R. A. W. Connor.

CHATHAM.—Medway College of Technology, 7 p.m. I.E.E. Maidstone District meeting. Discussion on "Planned Maintenance," opened by L. R. Rope, F. R. Wilkinson and R. Mellor.

HULL.—At the Yorkshire Electricity Board, Ferensway, 6.30 p.m. I.E.S. Leeds Centre. "Lighting for Sport," by M. W. Pierce.

ILFORD.—Angel Hotel, 8 p.m. A.S.E.E. North East London Branch. "Electrical Accidents in the Home," by S. J. Emerson.

LEEDS.—Great Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. "Vocational Education and its Relation to the Supervising Engineer," by W. H. Brooks.

LIVERPOOL.—At the Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. Chairman's address, by J. Collins.

LONDON.—Caxton Hall, S.W.1, 7 p.m. E.P.E.A. London Technical Group. "Recent Developments in Large Steam Turbines," by C. H. L. Westmacott.

NEWCASTLE-UPON-TYNE. — County Hotel, Neville Street, 6.30 p.m. North East Electrical Club. Annual general meeting, and presidential address by J. Bennett.

SHEFFIELD.—Royal Victoria Hotel, 7.30 p.m. A.S.E.E. Sheffield Branch. "The N.I.C.E.I.C. and its Commitments," by E. J. Sutton.

University, St. George's Square, 7 p.m. Society of Instrument Technology, South Yorkshire Section. "Education and Training of Instrument Personnel," by E. B. Jones.

Tuesday, 7th October

BIRMINGHAM.—Grand Hotel, 6 p.m. I.E.E. South Midland Centre. Chairman's address by J. Ashmore, followed by annual general meeting and conversazione.

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South East Scotland Sub-Centre. Chairman's address, by R. J. Rennie.

25, Charlotte Square, 7 p.m. Incorporated Plant Engineers, Edinburgh Branch. "District Heating," by G. E. H. Lewis.

HAMMERSMITH. — Windsor Castle Hotel, 134, King Street, 7.30 p.m. A.S.E.E. West London Branch. "Silicones for the Electrical Engineer," by B. F. W. Hayward.

LEEDS.—C.E.G.B. Offices, 6.30 p.m. I.E.E. North Midland Centre. Chairman's address, by J. D. Nicholson.

LONDON.—Mayfair Hotel, Berkeley Street, W.1, 5.30 p.m. Première of A.S.E.E. film, "Electrical Shop Window of 1958."

76, Mark Lane, E.C.3, 5.30 p.m. Institute of Marine Engineers. Presidential address, "The Training of Seagoing Engineers," by E. L. Denny.

Great George Street, Westminster, S.W.1, 5.30 p.m. Institution of Civil Engineers. "Engineering Problems in Recent River Valley Projects in India," by K. L. Rao.

At the Royal Society of Arts, John Adam Street, Adelphi, Strand, W.C.2, 7 p.m. Incorporated Plant Engineers, London Branch. "The Free Piston Engine and its Application," by R. W. S. Mitchell.

Mercury House, Theobald's Road, W.C.1, 2.30 p.m. Society of Relay Engineers. "Polythene Telephone Distribution Cables with Particular Reference to Jointing," by P. Sampson.

LOUGHBOROUGH. — Loughborough College, 6 p.m. I.E.E. East Midland Centre. Chairman's address, by D. E. Lambert, and annual general meeting.

LUTON.—At George Kent, Ltd., Biscot Road, 7.30 p.m. Institution of Production Engineers, South Eastern Region. "The Deficiencies of the Engineer-Manager," by J. L. Gwyther.

MANCHESTER.—Engineers' Club, 17, Albert Square, 6.30 p.m. I.E.E. North Western Centre. Chairman's address, by Professor F. C. Williams.

PETERBOROUGH.—White Lion Hotel, Church Street, 7.30 p.m. Incorporated Plant Engineers, Peterborough Branch. "The Jodrell Bank Radio Telescope."

READING.—Electricity Board Demonstration Room, Market Square, 7.15 p.m. A.S.E.E. Reading and Districts Branch. "A.C. Motor Variable Speed Control," by J. Bone.

STOKE-ON-TRENT.—North Stafford Hotel, 6 p.m. I.E.S. Stoke-on-Trent Group. "Modern Lighting and Production," by L. E. Gibbs.

Tuesday, 7th October, to Thursday, 9th October

LONDON. — Victoria Hall, Bloomsbury Square, W.C.1. B.R.E.M.A. International Exhibition of Styling Accessories.

Wednesday, 8th October

BIRMINGHAM.—James Watt Memorial Institute, 6 p.m. I.E.E. South Midland Graduate and Student Section. Chairman's address, by J. B. Gopsill.

Birmingham Exchange and Engineering Centre, Stephenson Place, 7.30 p.m. A.S.E.E. Birmingham Branch. "Transportation and Handling of Indivisible Loads," by S. Bowskill.

BRADFORD. — Midland Hotel, 7.30 p.m. A.S.E.E. Bradford Branch. "Electrode Boilers and their Applications," by J. C. Edwards.

BRADWELL.—I.E.E. London Graduate and Student Section. 12.30 p.m. Visit to Bradwell atomic power station site.

DUNDEE.—Taypark Hotel, West Ferry, 7.30 p.m. Incorporated Plant Engineers, Dundee Branch. "Forming of Metals."

ELTHAM.—Eltham Green School, Queenscroft Road, 7.45 p.m. A.S.E.E. South East London Branch. "Flameproof Equipment," by S. H. Harris.

LONDON.—At the Institution of Mechanical Engineers, Birdcage Walk, S.W.1, 6 p.m. Institution of Heating and Ventilating Engineers. "Waste Heat Recovery from Diesel Engines," by R. M. Tufnell.

LUTON.—Luton Chamber of Commerce, George Street, 8 p.m. A.S.E.E. Luton Branch. "Electronic Apparatus Maintenance," by W. Rich.

MANCHESTER. — Engineers' Club, Albert Square, 6.45 p.m. I.E.E. North-Western Radio and Telecommunication Group. Chairman's address, by Dr. R. Feinberg.

Engineers' Club, 17, Albert Square, 12.15 for 12.45 p.m. North Western Fuel Luncheon Club. Luncheon and annual general meeting.

NEWCASTLE-UPON-TYNE.—At the Institution of Mining and Mechanical Engineers, Neville Hall, Westgate Road, 6 p.m. British Institution of Radio Engineers, North Eastern Section. "Electronic Control Systems for Large Astronomical Telescopes," by G. H. Hickling and I. Paul.

NOTTINGHAM. — County Hotel, Theatre Square, 7 p.m. Incorporated Plant Engineers, East Midlands Branch. "Field Work in Atmospheric Pollution," by D. G. Lucas.

OXFORD.—S.E.B. Demonstration Room, 37, George Street, 7 p.m. I.E.E. district meeting. "Rockets and Satellites," by Dr. R. L. F. Boyd.

PRESTON. — North Western Electricity Board Demonstration Theatre, Friargate, 7.15 p.m. I.E.E. North Lancashire Sub-Centre. Chairman's address, by C. E. Smith.

RUGBY.—College of Technology, 6.30 p.m. I.E.E. Rugby Sub-Centre. Chairman's address, by E. M. Price.

WEMBLEY.—A.S.E.E. South West London Branch. Visit to Associated Rediffusion television studios (2.30 p.m.).

WOLVERHAMPTON. — Wolverhampton and Staffordshire College of Technology, Wulfruna Street, 7.15 p.m. British Institution of Radio Engineers, West Midlands Section. "An Introduction to Colour Television," by T. Jacobs.

YORK.—A.S.E.E. York Branch, 6.30 p.m. Visit to the British Oil and Cake Mills, Selby.

Thursday, 9th October

BRIGHTON.—Technical College, 6.30 p.m. I.E.E. Southern Graduate and Student Section. Chairman's address, by R. J. Barnard.

CHELMSFORD. — Crompton Parkinson's Social Hall, 7.30 p.m. Chelmsford Engineering Society. Presidential address, by R. W. J. Benyon.

EXETER.—Incorporated Plant Engineers, Western Branch, 7.15 p.m. "Aims and Objects of Incorporated Plant Engineers," by R. F. Farmer.

GLASGOW.—425/427, Sauchiehall Street, 7.15 p.m. Incorporated Plant Engineers, Glasgow Branch. "Corrosion," by F. S. Bricknell.

LEICESTER.—At Wadkin, Ltd., Green Lane Works, 7.15 p.m. Institution of Production Engineers, North Midlands Region. "Development of High Speed Machining Techniques for Non-Ferrous Materials," by S. Radcliffe.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Inaugural address, by the President, S. E. Goodall.

Manson House, Portland Place, W.1, 6 p.m. Society of Instrument Technology, Control Section. "Aircraft Flight Simulators," by Dr. A. E. Cutler.

NEWCASTLE-UPON-TYNE.—Roadway House, Oxford Street, 7 p.m. Incorporated Plant Engineers, North-East Branch. "Factory Inspection," by C. R. Noble.

NOTTINGHAM.—Black Boy Hotel. I.E.S. Nottingham Centre. Chairman's induction, and luncheon.

SCUNTHORPE. — 7.30 p.m. Incorporated Plant Engineers, Sheffield and District Branch. "Sheffield Mills and Sheffield Sections," by G. J. Wilkes.

SWANSEA. — S.W.E.B. Showrooms, The Kingsway, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. Chairman's address, by T. Gill.

WIMBLEDON.—Prince of Wales Hotel, 7.45 p.m. A.S.E.E. South West London Branch. "Modern Developments in Cold Cathode Lighting," by E. A. Langsdon.

Friday, 10th October

BIRMINGHAM.—Regent House, St. Philip's Place, Colmore Row, 7 p.m. Society of Instrument Technology, Midland Section. "Instrumentation in the Oil Industry," by A. Cowan.

FARNBOROUGH. — Queen's Hotel, 8 p.m. A.S.E.E. Aldershot and District Branch. Annual dinner-dance.

HANLEY.—Grand Hotel, 7.30 p.m. A.S.E.E. Stoke and Crewe Branch. Annual branch dinner.

LEEDS.—Guildford Hotel, 7 p.m. I.E.S. Leeds Centre. Chairman's induction and annual dinner.

LONDON.—Pepys House, 14, Rochester Row, Westminster, S.W.1, 7 p.m. Junior Institution of Engineers. "Photography in Industry," by C. Newland.

NEWPORT (I. of W.).—S.E.B. Showrooms, 6.30 p.m. I.E.E. Southern Centre. "Survey of Recent Developments in Marine Radar," by A. L. P. Milwright.

SHEFFIELD.—Maynard Arms Hotel. I.E.S. Sheffield Centre. Annual dinner and dance.

STONE.—Duncan Hall, 7 p.m. I.E.E. North Staffordshire Sub-Centre. Chairman's address, "Electrical Engineers and Electronics," by R. W. Palmer.

Saturday, 11th October

BERKELEY. — Plastics Institute, Western Section. Visit to atomic power station.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Belgium.—Minister of National Defence, Brussels. 14th October. Electrical lighting equipment for motor vehicles. (E.S.B. 23297/58. Ten/34765.)*

Burma.—Burma Purchase Board, Rangoon. 9th October. Induction motors. (E.S.B. 23215/58. Ten/34688.)*

Cornwall.—County Council. Electrical services in a new county secondary school. (See this issue.)

France.—Purchasing and Contracts Officer, ACE Communications Electronic Equipment, SHAPE, Paris. 13th October. Insulated cable. (E.S.B. 23611/58. Ten/34807.)*

India.—Madras State Electricity Board. 15th October. Lightning arrestors. (E.S.B. 23572/58. Ten/34779.)*

Iran.—Plan Organisation, Tehran. 12th October. Electrical network at Kalatchay. (E.S.B. 23440/58. Ten/34775.)*

Korea.—Government Office of Supply, Seoul. 8th October. Equipment, including electronic kits, scientific and laboratory equipment, transformers, and air conditioning equipment. (E.S.B. 23451/58/I.C.A. Ten/34790.)*

London.—Lewisham Borough Council. 20th October. Equipment for main street sodium lighting. (See this issue.)

Saltburn and Marske (Yorks.)—U.D.C. Electrical installation in 30 houses at Marske. Surveyor, Council Offices.

Stratford-on-Avon. — Corporation. 16th October. Street lighting equipment. (See this issue.)

Sunderland.—Corporation. Electrical installation in 298 houses on the Grindon Village estate. Borough architect, Grange House, Stockton Road.

ORDERS PLACED

Farnham.—U.D.C. Lighting installations in classified roads (£39,294).—Revo Electric Co.

Glasgow.—Education Committee. Electrical work at primary school, Barmulloch (£4,085). —Mobile Electric Services.

Heywood.—Corporation. Electrical installations in 108 dwellings at Heady Hill.—Simmons Electrical Contracting Co.

Lancashire.—Education Committee. Renewal of electrical installations: Rawtenstall Lea Bank County Secondary School (£2,152). —A. R. Dent. Farnworth St. Gregory's R.C. School (£1,266).—F. Walker. Ashton-under-Lyne Hurst Methodist School (£895).—Brindle & Kirby. Leigh King Street Methodist (Controlled) School (£963).—Engineering Service Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Bedford.—Three blocks of 12-storey flats in central redevelopment area; borough architect.

Factory and offices, Hoo Farm estate; Texas Instruments, Ltd., Dallas Road.

Bedlington.—New offices for U.D.C.; A. K. Dennis, surveyor.

Bishop Auckland.—Offices for the Liverpool Victoria Friendly Society, Southampton Row, London, W.C.1.

Blackpool.—Residential home for blind persons, Bosworth Place; manager, Blackpool and Fylde Society for the Blind, Castlegate, Lytham Road.

Blaydon-on-Tyne.—Factory additions for Logan Engineering Co.; Alston Limestone Co., contractors, Westgate Road, Newcastle-on-Tyne.

Cambridge.—Teaching hospital for Addenbrooke's Hospital; Easton & Robertson, architects, 53, Bedford Square, London, W.C.1.

Chelmsford.—Houses (68), Beeches Road; Cooper Estates, Ltd., Wilmington House, Dartford, Kent.

Cleethorpes.—Flats (32), Beacon Hill estate; borough surveyor.

Coventry.—Erection of Three Spires Special School, Bray's Lane; W. S. Hattrell & Partners, architects, 1, Queens Road.

Dwellings (244), Willenhall Wood estate; city architect.

Dorchester.—Houses (100), southern area; L. Magnus Austin, architect, Bowling Alley Walk.

Havant.—Adult education centre; Yorke, Rosenberg & Mardall, architects, 2, Hyde Park Place, London, W.2.

Leeds.—County secondary schools, Moor Grange and West Leeds and C.P. school, Cookridge; city architect, Priestley House, Quarry Hill, Leeds, 9.

Lochgelly.—Houses (91), north of Main Street; Gentles & Son, quantity surveyors, Hill Street, Edinburgh.

London.—Central library, Theobald's Road, W.C.1, for B.C.; Holland & Hannen and Cubitts, Ltd., builders, 1, Queen Anne's Gate, S.W.1.

Multi-storey office block, Holborn Viaduct; A. Roberts & Co., Ltd., builders, 79, Eccleston Square, S.W.1.

Flats (30), Gill Street, Stepney; A. A. Stuart & Sons, Ltd., builders, 108, Victoria Street, S.W.1.

Luton.—Dwellings (64), Poynters Road; Drury & Co., Ltd., The Grange, Wigston Fields, Leicester.

Morpeth.—Housing scheme at Pegswood for the R.D.C. (£210,000); J. R. Miles, surveyor.

Newcastle-on-Tyne.—Houses (152), Newbiggin Hall estate; Cussins, Ltd., contractors, The Drive, Gosforth.

Fifty-four flats and maisonnettes and three shops, near Wharrier Street; J. H. Fisher & Co., Ltd., builders, Lansdowne Terrace, Gosforth.

North Riding.—Additions to new Earswick Joseph Rowntree School for the E.C. (£65,000); York Co-operative Society, contractors, York.

Oxford.—Law Library Building and Institute of Statistics, Manor Road, for University; Sir Leslie Martin, consulting architect, School of Architecture, Cambridge.

Plymouth. — Offices; Sutton Harbour Improvement Co., 29, Woolster Street.

Portsmouth.—Factory, Zetland Road, Farlington, for B. O. Morris, Ltd., Albion Works; Geo. Wimpey & Co., Ltd., builders, Hammersmith Grove, London, W.6.

Reading.—Five-storey showrooms and offices, Friar Street; Rush & Tompkins, Ltd., builders, 109, Station Road, Sidcup.

Redcar.—Houses (202), Lakes estate; Gregory Housing, Ltd., builders, Worthing.

Redditch.—Factory, Arthur Street; Birmingham Tempered Spring & Presswork Co., Ltd., 101, Irving Street, Birmingham, 15.

Rogerstone (Mon.).—Works extensions (£3,000,000); Northern Aluminium Co., Ltd.

Saltburn (Yorks).—Houses (30), Marske; U.D.C. surveyor.

Scunthorpe. — Proposed civic centre (£340,000); borough surveyor.

Seaham.—Welfare hall, Vane Tempest Colliery (£27,000); D. & J. Ranken, Ltd., builders, Stockton Road, Sunderland.

Seaton Valley (Northumberland).—Shop and office block, Shiremoor, for Seaton Valley Radio Relay Co.; Arthur & Kirkup, architects, 13, Swinburne Street, Gateshead.

Sheffield.—Works, Kettlebridge; C. & J. Hampton, Ltd., Bernard Road.

Southampton.—14 shops and 36 dwellings, Inner Ring Road (Contract No. B.273); 126 four-storey flats, Millbrook (Contract No. B.324); 28 four-storey flats, Portswood Road (Contract No. B.325); borough engineer, Civic Centre.

Sprowston.—Proposed factory on large site at Salhouse Road, for Roneo, Ltd.; A. W. Pipe & Sons, architects, 8, Queen Street, London, E.C.4.

Stanley (Co. Durham).—Houses (77) at Annfield Plain for the U.D.C.; J. R. Heslop, surveyor.

Stockton-on-Tees.—Junior school at Hardwick; T. C. Hartley, borough architect, 28, The Square.

Sunderland. — Rebuilding offices, John Street, for the Royal Assurance Co., Ltd.; Matthews & Co., builders, 25, Villiers Street, Sunderland.

Tottenham.—Maisonnettes and flats (37), Willoughby House site; M. Lindsay Taylor, town clerk, Town Hall, N.15.

Truro.—General Hospital at Treliske; Adams, Holden & Pearson, architects, 38, Gordon Square, London, W.C.1.

Walton-on-Thames.—Chronic sick unit, Queen's Road; R. Lewis Reynish, architect, Kent Lodge, Queen's Crescent, Southsea.

Washington (Co. Durham).—Works additions for the Washington Chemical Co., Ltd.; own architects.

Flats at Washington Station and Hertburn Gardens; T. E. Crowe, U.D.C. surveyor.

Watford.—Housing scheme, Oxhey Place estate, South Oxhey; D. C. Denton-Smith & Partners, architects to R.D.C., 40, Regent Street, Cambridge.

West Bromwich.—Houses (107); W. H. Greenwood, borough engineer, Town Hall.

West Hartlepool.—Houses (60), Owton Manor estate and primary school, Owton Manor Lane; A. G. Sinclair, borough architect, Municipal Buildings.

Weymouth.—Houses (52), Chalberry Close; G. Blackwell & Son, builders, 308, Dorchester Road, Upwey.

Ritz Theatre and Dance Hall; Verity & Beverley, architects, 35, Doughty Street, London, W.C.1.

Whickham-on-Tees. — Houses (108), Orchard building estate; A. Watson, builder, Front Street.

Wigan.—Dwellings (199), Marsh Green estate; G. Keighley, borough engineer, Library Street.

Wigton.—Bus station, King Street, for Cumberland Motor Services, Whitehaven.

Windsor.—Shops, restaurant and offices, River Street/Thames Avenue site; Denney Bros. (Bakeries), Ltd., Thames Side.

Wrexham.—Erection of new guildhall (£127,000); J. M. Davies, borough surveyor, 31, Chester Street.

Yeovil.—Houses (115), off Coast Road; Lucas Bros., builders, Mudford Road.

Yorks (North Riding).—Final instalments of Eston Grammar and Technical School and Thirsk Grammar and Modern School; Leathart & Tingay, architects, 49, Welbeck Street, London, W.1.

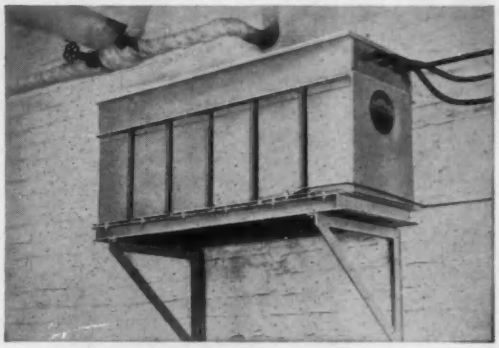
* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

A Powerful Factor in Power Factor Correction

Unit construction method pays dividends

A small factory with a load maximum demand of 31 kVA and a tariff of 10/- per month per kVA, installed a capacitor bank. The power factor was improved from 0.79 to 0.98, resulting in an annual saving of £36.

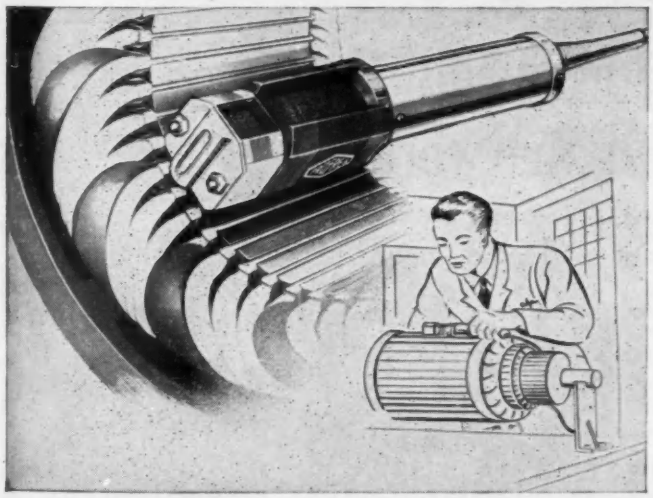
The cost of the capacitor bank and switch (manual) was £63, showing a return on the investment of 57% per annum.



The illustration shows a 120 kVAr 415 volt 50 c/s 3 phase Oil Immersed Power Factor Correction Capacitor Bank. In accordance with Dubilier practice for over 30 years this is built on the unit principle, consisting of six 20 kVAr Capacitor Units each in its own hermetically sealed steel tank. Each capacitor Unit is connected internally in delta and is provided with permanently connected discharge resistors in each phase. Capacitor Banks of this construction, requiring no servicing, can conveniently be mounted out of the way on a wall, thus saving very valuable factory floor space.

Dubilier Condenser Co. (1925) Ltd., Ducon Works, Victoria Rd., North Acton, London W.3 · Phone: ACOrn 2241 · Grams: Hivoltcon Wesphone London

Universal fault finder . . . MARTINDALE



'Prufrex' A6 TESTER

A new sensitive universal fault finder.
Will test largest alternator or smallest aircraft type motor.
Locates short circuit—open coil—wrong connection.
Immediate delivery.

Write for descriptive leaflet to:
MARTINDALE ELECTRIC CO. LTD., 4 WESTMORLAND ROAD, LONDON, N.W.9
Tel. : COLindale 8642 also at 25 ELMBANK STREET, GLASGOW, C.2

...more and more 'ENGLISH ELECTRIC' sub-station transformers

A 500 kVA Pyroclor filled transformer for a recent contract for Iraq.

A 225 kVA subway transformer—one of a batch recently supplied to South America.

...are being installed all over the world

wherever soundness of design and reliability in service are of paramount importance

'ENGLISH ELECTRIC' transformers

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2

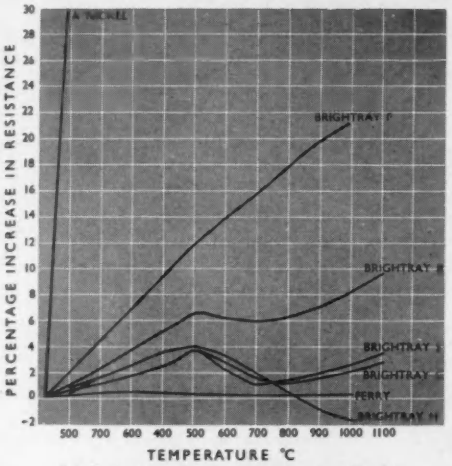
Transformer Department, Liverpool

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

TFL.31A8

HOW TO SELECT THE BEST ELECTRICAL RESISTANCE ALLOY

Changes in electrical resistance with temperature —a vital design consideration



Graphs showing resistance/temperature curves for various Wiggin electrical resistance materials.

In most electrical heating appliances, it is desirable that changes in the electrical resistance of materials with changing temperature should be slight. For other purposes, a high temperature coefficient of electrical resistance is an essential factor in design. Here are details of the way in which electrical resistance materials produced by Wiggin meet these varying requirements.

LOW TEMPERATURE COEFFICIENTS Brightray C, Brightray S and Brightray H offer a low temperature coefficient. Brightray B has a slightly higher coefficient, and it is usual to make allowances for this by basing calculations on the electrical resistance of the material at the operating temperature.

PROPERTIES FOR FURNACE ELEMENTS Brightray F has a somewhat larger coefficient but as this alloy is intended for furnace elements, where control gear will be used, the change may be compensated by voltage adjustment.

PROPERTIES FOR ELECTRICAL CONTROL GEAR An extremely low coefficient of resistance is offered by Ferry, a 45/55 nickel copper alloy which is available in a number of special grades. For this reason, it is used widely in control gear where constant resistance over a wide range of temperatures is necessary.

INCREASING RESISTANCE AS A MEASURE OF TEMPERATURE Nickel shows a marked increase of resistance as temperature rises and use is made of this property in devices such as resistance thermometers, where the change of resistance is used as a measure of temperature. It is also employed in electrically-heated blankets where increase of resistance with rise in temperature is used as an automatic temperature control.

EFFECTS OF MANIPULATION OR SPIRALLING The electrical resistance of a material is affected by mechanical work such as spiralling or manipulation during manufacture, but it will revert to a stable normal on slow cooling. The initial heating and cooling cycles experienced in service will be sufficient to achieve this result, and it is therefore important to base all calculations on resistance of the alloy in the slowly cooled condition.

BRIGHTRAY

ELECTRICAL RESISTANCE ALLOYS

Produced in the form of Rod, Wire, Strip and Tape

The Brightray series of alloys provides a range of materials for use at operating temperatures up to 1250°C. For each grade, maximum operating temperatures are quoted, based on numerous tests and long practical experience, which should be regarded as the optimum to give economical life.

BRIGHTRAY C *for intermittent heating up to 1150°C . . . used in cookers, toasters, laundry irons, fires, soldering irons . . .*

BRIGHTRAY B *produced to provide a cheaper but satisfactory material for elements working up to 950°C . . .*

BRIGHTRAY S *for* continuous *heating up to 1150°C . . . principally intended for electric furnace heating elements . . .*

BRIGHTRAY F *for electric furnace elements operating in special atmospheres up to 1000°C . . .*

BRIGHTRAY H *for electric furnace elements operating in the range 1100-1250°C . . .*

WILCO-WIGGIN THERMOMETALS *in many grades for thermostatic devices controlling temperatures ranging from −75 to 540°C.*

The choice of materials for electrical heating elements is a job for the expert. Our Technical Service engineers are always ready to give advice on the selection and application of Wiggin electrical resistance materials.

BRIGHTRAY

A PRODUCT OF* WIGGIN *KNOW-HOW

WIGGIN NICKEL ALLOYS

'Wiggin Nickel Alloys' our technical journal, contains useful and interesting data on the application of Wiggin nickel alloys in the electrical and many other industries. May we send you a specimen copy?

'Brightray' and 'Wilco-Wiggin' Thermometals are Registered Trade Marks

HENRY WIGGIN & COMPANY LIMITED · WIGGIN STREET · BIRMINGHAM 16

TGA 23A

TAKE YOUR PICK

Our wide range of capacitors, incorporating all the very latest developments, are described fully in these new leaflets . . .

SEND NOW for COPIES

DALY has succeeded in maintaining full capacity values and working voltages in more compact designs, specially suited to ultra-modern equipment:

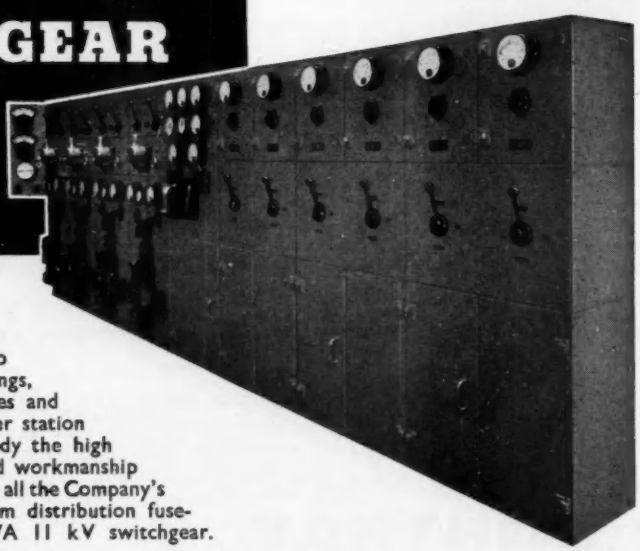
PHOTO-FLASH EQUIPMENT • DEAF AIDS
PRIVATE TELEPHONE INSTALLATIONS
AMPLIFIERS • D.C. POWER UNITS
TRANSISTOR EQUIPMENT
MAGNETISATION EQUIPMENT
TEST GEAR

DALY
ELECTROLYTIC CAPACITORS

Condenser Specialists for over 20 years.

DALY *(Condensers)* **LTD.,** WEST LODGE WORKS,
THE GREEN, EALING, LONDON, W.5. PHONE: EALING 3127-8-9. CABLES: DALCYON, LONDON

CUBICLE TYPE
SWITCHGEAR
MEDIUM VOLTAGE

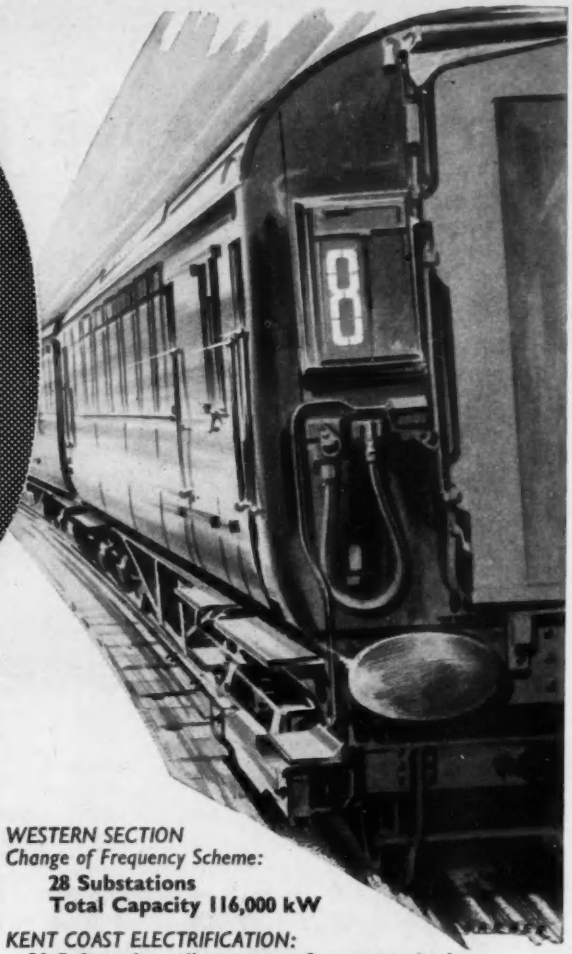


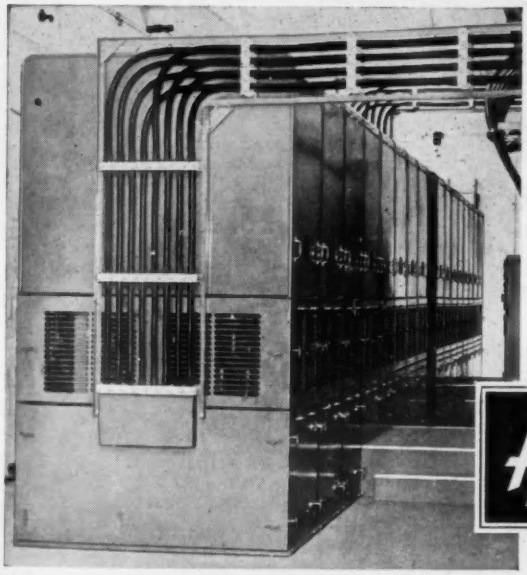
Switchboards of this type have been supplied to hospitals, public buildings, banks, industrial premises and for the control of power station auxiliaries. They embody the high standard of design and workmanship which is to be found in all the Company's products ranging from distribution fuse-boards to 250 MVA 11 kV switchgear.

THE NEW SWITCHGEAR CONSTRUCTION CO. LTD.
WELLESLEY ROAD · SUTTON · SURREY · TELEPHONE: VIGILANT 8234

Associated with Hackbridge & Hewittic Electric Co. Ltd.

HEWITTIC RECTIFIERS on BRITISH RAILWAYS SOUTHERN REGION





WESTERN SECTION
Change of Frequency Scheme:
28 Substations
Total Capacity 116,000 kW

KENT COAST ELECTRIFICATION:
31 Substations (in course of construction)
Total Capacity 82,500 kW

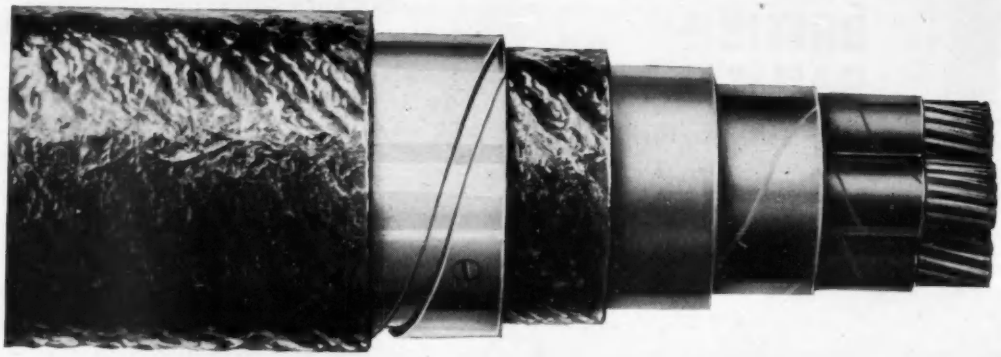
The illustration left, shows two Hewittic Rectifiers forming a 5,000 kW bank in the Dover Substation.

Hewittic Rectifiers

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone: Walton-on-Thames 760 (8 lines) *Telegrams & Cables: "Electric, Walton-on-Thames"*

OVERSEAS REPRESENTATIVES.—**ARGENTINA** H. A. Roberts & Cia., S.R.L., Buenos Aires. **AUSTRALIA** Hackbridge and Hewittic Electric Co. Ltd., 171 Fitzroy Street, St. Kilda, Victoria; N.S.W., Queensland, W. Australia: Elder, Smith & Co. Ltd.; South Australia: Parsons & Robertson Ltd.; Tasmania: H. M. Bamford & Sons (Pty.) Ltd., Hobart. **BELGIUM & LUXEMBOURG** Pierre Pollie, Brussels 3. **BRAZIL** Oscar G. Mors, Sao Paulo. **BURMA** Neonlite Manufacturing & Trading Co. Ltd., Rangoon. **CANADA** Hackbridge and Hewittic Electric Co. of Canada Ltd., Montreal; The Northern Electric Co. Ltd., Montreal, etc. **CEYLON** Envee Ess Ltd., Colombo. **CHILE** Sociedad Importadora del Pacifico Ltda., Santiago. **EAST AFRICA** Gerald Hoe & Co., Nairobi. **EGYPT** Giacomo Cohenca Fils, S.A.E., Cairo. **FINLAND** Sähkö-ja Koneliike O.Y. Hermes, Helsinki. **GHANA, NIGERIA & SIERRA LEONE** Glyndova Ltd. **GREECE** Charilaos C. Coroneos, Athens. **INDIA** Steam & Mining Equipment (India) Private Ltd., Calcutta; Easun Engineering Co. Ltd., Madras 1. **IRAQ** I. P. Bahoshy Bros., Baghdad. **MALAYA, SINGAPORE & BORNEO** Harper, Gilfillan & Co. Ltd., Kuala Lumpur. **NETHERLANDS** J. Kater E.I., Ouderkerk a.d. Amstel. **NEW ZEALAND** Richardson, McCabe & Co. Ltd., Wellington, etc. **PAKISTAN** The Karachi Radio Co., Karachi 3. **SOUTH AFRICA** Arthur Trevor Williams (Pty.) Ltd., Johannesburg, etc. **CENTRAL AFRICAN FEDERATION** Arthur Trevor Williams (Pty.) Ltd., Salisbury. **THAILAND** Vichien Phanich Co. Ltd., Bangkok. **TRINIDAD & TOBAGO** Thomas Peake & Co., Port of Spain. **TURKEY** Dr. H. Salim öker, Ankara. **U.S.A.** Hackbridge and Hewittic Electric Co. Ltd., P.O. Box 234, Pittsburgh 30, Pennsylvania. **VENEZUELA** Oficina de Ingenieria Sociedad Anonima, Caracas.

ESSENTIAL TO THE CABLE INDUSTRY



Jute yarns by CAIRD

Cable Manufacturers prefer Caird's Jute Yarn for core binding because of its superior quality so essential in the making of a top quality cable.

Only the best quality spun yarn is supplied. Every stage is supervised by experienced men and women of the Dundee Jute Industry.

CAIRD (DUNDEE) LTD
JUTE SPINNERS & MANUFACTURERS,
ASHTON WORKS, DUNDEE
Registered Office: 195 Hawkhill, Dundee

Subsidiary Company
JAMES PRAIN & SONS LTD.
SPINNERS & MANUFACTURERS
LARCHFIELD WORKS, DUNDEE

120 HOURS A WEEK

Non-Stop!

We specialize in the design and manufacture of automatic sequence control panels and have supplied them to practically every industry.

This Control Panel has been designed and built for the sequence control of synthetic resin coated sand processing. The machine operates 5 days a week—day and night—non-stop producing 1½ tons of coated sand every hour. After loading the hoists the Panel automatically controls all process operations including discharge into the sacks. The Floor Mounted Controller incorporates H.R.C. fuses and heavy duty automatic starters for all motors which total 100 horse power. Mounted on the Panel are 6 visible continuously adjustable dial process timers with tamper proof operation counter giving full automatic control of the coating operations with manual control for sampling. This method of automatic control definitely reduces production costs. Scrap caused by incorrect mixing by hand is entirely eliminated and uniformity in batch production constantly maintained.

May we receive your enquiries - We are confident that our suggestions will save you time and product cost!

Send for our catalogue illustrating special panels and complete range of Standard Motor Control equipment.

Illustration shows the compact design of the B.K.S. Panel.

BKS

SPECIALISTS IN ELECTRICAL CONTROL

post this coupon today

BRITISH KLOCKNER SWITCHGEAR LTD.

HEAD OFFICE & WORKS: **CHERTSEY, SURREY.**

Telephone: Chertsey 3467

LONDON:	Refer to Head Office.
MANCHESTER:	Cromford House, Cromford Court, Manchester 4. Tel: BLAckfriars 3903.
GLASGOW:	249, St. Vincent Street, Glasgow C.2. Tel: CENtral 2479.
NEWCASTLE:	Mr. H. Breeze 4, Beechwood Avenue, Monkseaton, Whitley Bay, Northumberland, Tel: Whitley Bay, 24231.
BIRMINGHAM:	Mr. J. Perry, 45, Streetly Crescent, Four Oaks, Sutton Coldfield. Warwickshire. Tel: Streetly 1641
DUBLIN:	Mr. H.E. Kilbride-Jones, 11, Crow Street, Dublin. Tel: Dublin 71717.

To BRITISH KLOCKNER SWITCHGEAR LTD.
CHERTSEY, SURREY.

Please send me your latest comprehensive catalogue.

NAME.....

POSITION.....

FIRM.....

ADDRESS .....

ER/10/58

.....

BSS 775 Plus

Buyers of contactors always ask: "Does it conform to BSS 775?" This requires a Class IV contactor to have a minimum life of 5 million mechanical operations.

Apart from fulfilling all the other conditions of BSS 775, Klockner-Moeller England Limited supply contactors which are guaranteed for 10 million operations, not merely mechanical but load breaking.

Klockner-Moeller ENGLAND LIMITED
Guaranteed life control gear
7 Charterhouse Buildings, Goswell Rd., London, E.C.1
and at Manchester, Birmingham, Gateshead

N.D.A.503

p.v.c. insulated and sheathed interphone cables

suitable for the wiring of all telephone installations

Please send me Stock list of Plastic Insulated and Sheathed Power, Control & Telephone Cables

NAME .....

ADDRESS .....

.....

LARGE STOCKS HELD

1/·024 inch and 1/·036 inch Conductors Armoured or Unarmoured in both sizes.

SEND COUPON

Standard Telephones and Cables Limited

Registered Office: Connaught House, Aldwych, London, W.C.2

48, NORTH ROW, PARK LANE, LONDON, W.1

REPRESENTATIVES AND WAREHOUSES: Birmingham, Bristol, Dublin, Glasgow, London, Leeds, Liverpool, Manchester, Newcastle, Newport Nottingham, Sheffield, Southampton, Swansea, Belfast (A. W. Gordon, Ltd., Agent).

Insist on

T.E.C.

Power and Distribution Transformers to 100 kVA, Low Voltage Flash Test and Rectifier Units, Metal Work, Light Assembly, Slotted Angles and Transformer & Electrical Repairs

DISTRIBUTION TYPES
UP TO 100 K.V.A. 11 K.V.

Leaflets on request:—

The TRANSFORMER & ELECTRICAL CO. LTD.
HONYWOOD RD., BASILDON, ESSEX
Telephone: Basildon 20491/3

AUTOMATIC VOLTAGE REGULATORS

for

A.C. & D.C. GENERATORS

and for

EXCESSIVE VOLTAGE VARIATIONS ON A.C. SUPPLY SYSTEMS

All types accurate to ± 1%
Self-contained for simple installation
Negligible maintenance

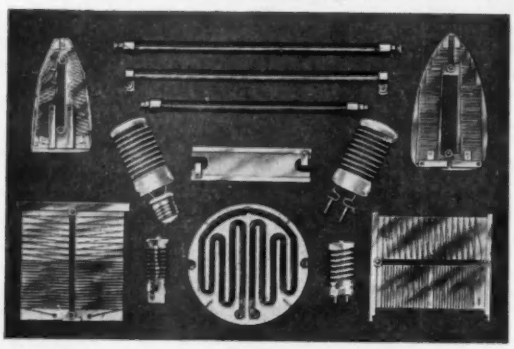
Send details of your voltage problems to the Voltage Regulator specialists:—

COX-WALKERS LTD.
NORTH-EASTERN ELECTRIC WORKS
FEETHAMS – – DARLINGTON
EST. 1880 PHONE 2387

***dependable* ELEMENTS**

for every job

Stocked by Leading Wholesalers

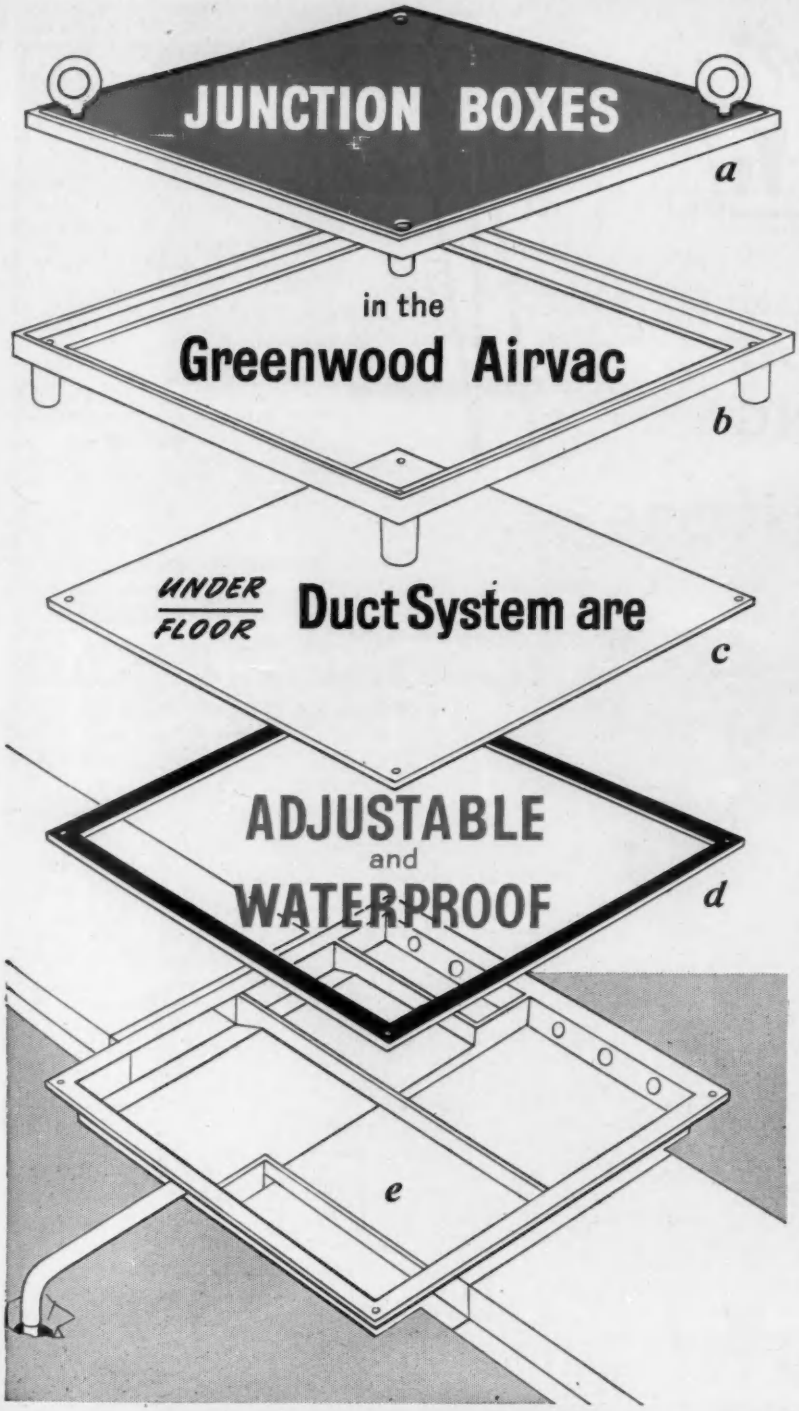


THE ELECTRIC ELEMENTS CO.
Tokenhouse Yard, **NOTTINGHAM**
Makers of Elements since 1921

Are you satisfied with the Quality, Price and Service of the Silver Plating on your Electrical Contacts

FULLY APPROVED A.I.D.-A.R.B.
ALL FINISHES

N.T. FROST LTD.
SPECIALIST ELECTROPLATERS
HARFORD ST., BIRMINGHAM 19
CENtral 4135 (6 Lines)



The Greenwood Airvac Underfloor Duct System provides for *flexibility* in office and factory layout. Every feature is planned to meet the demands of Architect and Electrical Engineer.

Take the junction box as an example.

The *brass frame* (*b*) can be adjusted independently before *and after* screeding, using the keys supplied. The *brass floor tray* (*a*), shown with lifting bolts in position, will accept any depth of floor thickness from 3/16″ to 7/8″ terrazzo or wood blocks.

The *cover* and *gasket* (*c* and *d*) ensure a really watertight box which can be laid in 1½″ screed. And, of course, *crossovers* (*e*) enable cables to be segregated.

The Junction Box is just one feature of Greenwood Airvac underfloor Conduits.

Purpose-made to accommodate ducts from 4″ x 1″ upwards.

Write for further details and information about the Greenwood Airvac underfloor and skirting duct systems —or call to see the demonstration layouts.

Greenwood Airvac Conduits Ltd

Patentees, Designers and Manufacturers of Electrical Conduit Systems

CARLISLE HOUSE, 8 SOUTHAMPTON ROW, LONDON W.C.1. CHAncery 9377 (3 lines) 'Grams: Aircon, Westcent, London

C

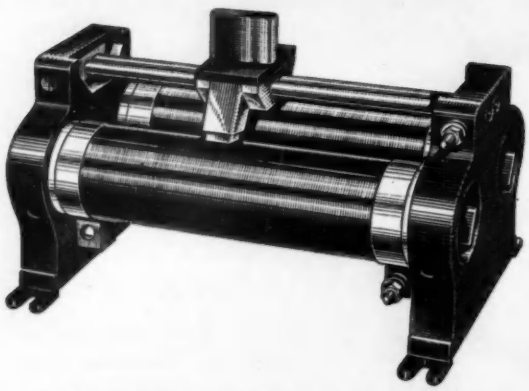
Consult

Birch

REGISTERED TRADE MARK

for

TUBULAR
SLIDING
and
FIXED RESISTORS



Tubular Sliding and Fixed Resistors. Winding Oxidised Nickel Copper Wire to B.S.115. Brushgear: laminated phosphor bronze brushes or copper graphite brushes in brass die-cast holders. Finish: metal parts heavily nickel plated.

Write for list No 110.

Asbestos Woven Resistor Nets	Heating Elements
Battery Charging Resistors	Loading Resistors
Cartridge Heaters	Motor Operated Resistors
Cubicle Heaters	Resistor Units
Dimming Resistors	Stud Type Resistors
Porcelain and Mica Wound Resistors	Sliding Resistors
	Strip Heaters Metal Cased
	Toroidal Resistors

VITREOUS ENAMELLED RESISTORS

Ferrule or wire end type. Full range of 24 sizes — 1¼ — 250 watts. List V.E. 190.

Birch

REGISTERED TRADE MARK

H. A. BIRCH & CO. LTD.

WOOD STREET, WILLENHALL, STAFFORDSHIRE

Telephone WILLENHALL 494 · 495 · Grams WILOHM WILLENHALL

LONDON OFFICE: 1-5 NORTHOLT ROAD, HARROW, MIDDLESEX

Telephone: BYRON 5120

Resistance wires

Insulating Beads

7 Springfield Street
Warrington Warrington 34391/2

102 Abbey Street
Accrington Accrington 2774

161/163 Eldon Street
Preston Preston 57975/6

Lionel Robinson & Co. Ltd.

4 Staple Inn, London, W.C.1

Telephone - - HOLborn 6322

FAP

CONDUIT
FITTINGS AND
ACCESSORIES

For quality & service

FLEXIBLE
METALLIC TUBING
AND ADAPTORS

FITTER & POULTON ltd.

TELEPHONE CALTHORPE 1151-2 · TELEGRAMS FAP BIRMINGHAM

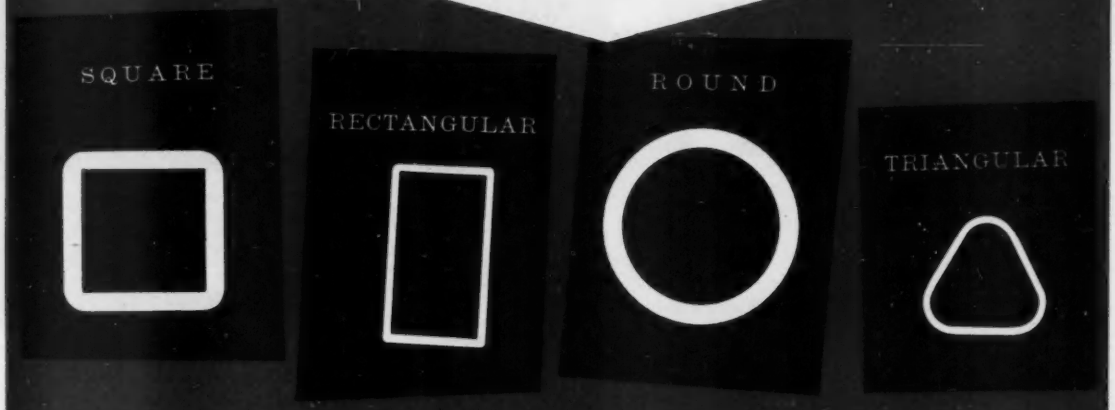
VINCENT PARADE · BIRMINGHAM · 12

SM/PP 3653/1

GET ON TO

M & I FOR

'PAXOLIN' TUBES



IN ANY QUANTITIES;
IN VARIOUS LENGTHS AND
WITH A VERY WIDE RANGE
OF INSIDE DIMENSIONS
AND WALL THICKNESSES

"Paxolin" is the registered trade mark for our synthetic resin bonded laminate having paper, fabric, glass, nylon, asbestos or other fillers bonded with ethoxyline, melamine, phenolic, silicone or other resins.

Please write for our booklet "Paxolin tubes and cylinders"

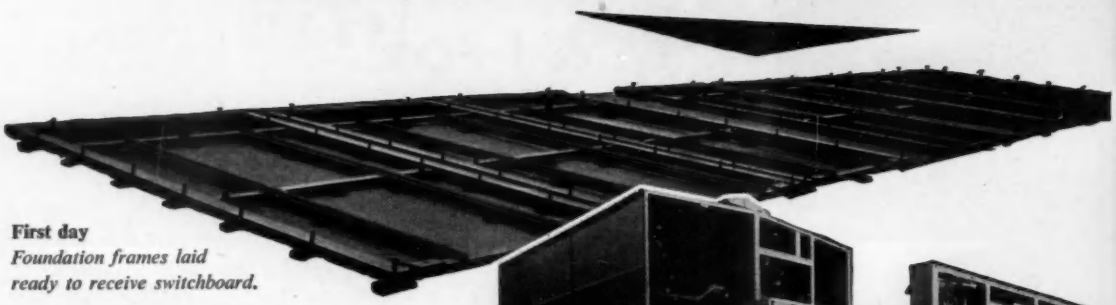
m and i

the electrical insulation people

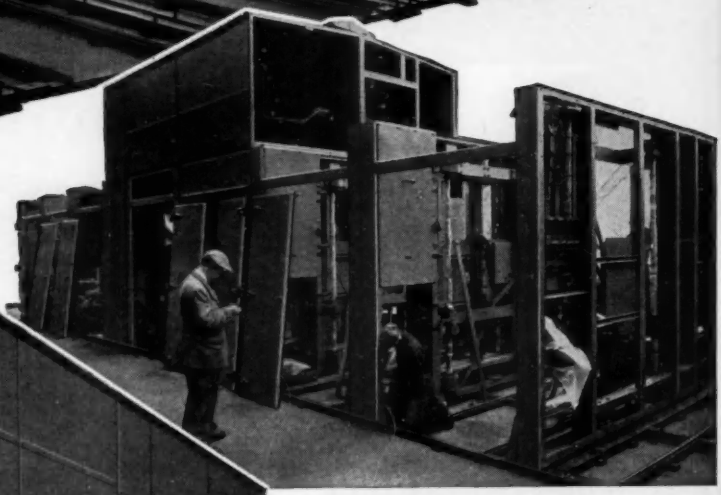
THE MICANITE & INSULATORS CO., LTD.,

BLACKHORSE LANE, WALTHAMSTOW, LONDON, E.17 · Tel: Larkswood 5500 · Telegrams: "Mytilite", Easphone, London

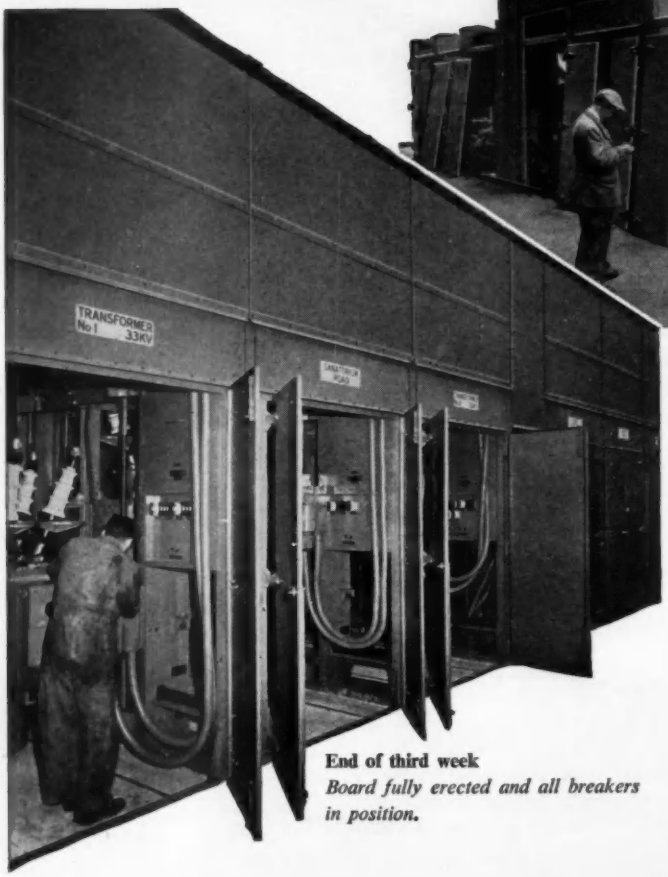
33 kV OUTDOOR AIR INSULATED SWITCHGEAR ERECTED IN 3 WEEKS



First day
Foundation frames laid ready to receive switchboard.



Third day *Showing sides, frames, and two of the busbar chambers in position.*



End of third week
Board fully erected and all breakers in position.

Shown here is a 7-panel, 33,000 volt air insulated, metalclad switchboard installed in the centre of a large industrial area in South Wales. It was completed ready for cabling in 3 weeks from the laying of foundation frames. The space required for this 7-panel board is only some 60 sq. yards compared with an equivalent conventional outdoor sub-station of some ten times this area.

SOUTH WALES SWITCHGEAR LTD.

BLACKWOOD · MONMOUTHSHIRE · Works at BLACKWOOD and TREFOREST.

SWITCHGEAR, SWITCHFUSEGEAR, TRANSFORMERS, CONTROL BOARDS

TGA 621

SATCHWELL

AUTOMATIC TEMPERATURE CONTROLS

ELECTRIC COOKING

New range of Satchwell Superswitches for infinite regulation of heat input to boiling plates. Thermostats of various types for controlling domestic and industrial ovens.

ELECTRIC WATER HEATING

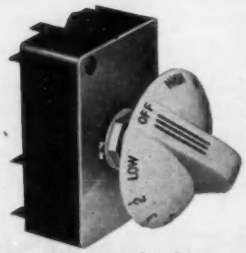
A range of Satchwell thermostats for controlling domestic electric storage and immersion water heaters.

ELECTRIC SPACE HEATING

Satchwell thermostats and contactors for automatic control of electric space heating. QA/QR system controls electric storage heaters according to conditions inside and outside a building.

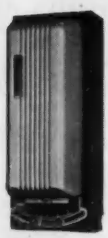
INDUSTRIAL PROCESSES

A range of industrial thermostats, two-position and modulating throttling, mixing and diverting valves for steam, hot water and other liquids and gases.



Satchwell Superswitch infinite control for boiling plates

Satchwell VK water heater thermostat for pre-set or variable operation



Satchwell Q room thermostat

SATCHWELL

THE RHEOSTATIC CO. LTD.

SLOUGH - BUCKS

Slough 23961

QUICKWAY

Taping machines

SPEEDY

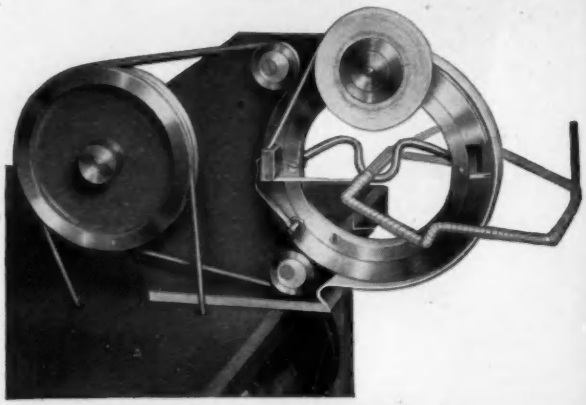
taping for all type coils

Tapes stator and armature coils quickly and neatly. Other applications are the taping of busbars, wiring harnesses, etc.

A necessity for repairs or production, and an ideal companion to a "QUICKWAY" Coilwinding and Forming Machine.

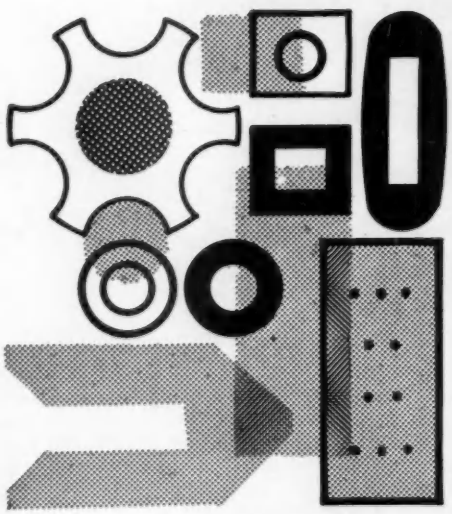
We can offer individual items with the machine such as clutch unit and motor, or a complete arrangement with bench.

Full details on request.



THE MIDLAND DYNAMO CO. LTD.

QUICKWAY WORKS - LEICESTER - Tel. 20172 (5 lines) Grams: "DYNAMO" LEICESTER



The shapes of precision

Electrical Insulation . . .

Mica and other insulating components

We are manufacturers of essential Insulation Parts, to the Electrical Industry over an extensive field both at home and overseas. A wide range of Mica, bonded resin and Micanite Processed Parts, punched, cut, split and gauged to precise specifications are produced speedily and with the utmost accuracy. A large section of our resources is devoted to the production of heating element insulating parts, stove plates, water level gauge glasses, compass cards and washers. Enquiries relating to all markets are welcomed.

DACIER Ltd

22 BARGATES · CHRISTCHURCH · HANTS · ENGLAND

Tel.: Christchurch 1011

CONTACTORS FOR HEATING LOADS

TYPE CRW/AC

for 60-amp. A.C. Heating Load.

We are pleased to be able to announce that in accordance with the provisions of B.S.775/56, we are able to offer improved ratings for our 15 and 50-amp. A.C. Contactors, Types CNY, CRY and CNW, CRW respectively.

When fitted with silver faced contacts and used on category A.1 duties i.e. Heating and Resistive Loads the new ratings are :—

Type CNY/AC
or
CRY/AC....30 amps.

Type CNW/AC
or
CRW/AC....60 amps.

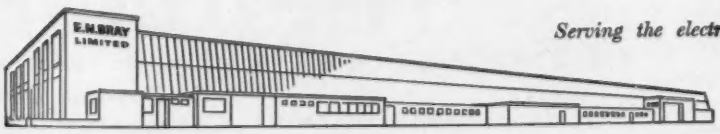
Type CNY and CNW have a laminated magnet system for A.C. excitation.

Type CRY and CRW incorporate a rectifier permitting the use of a solid magnet system and D.C. excitation. This ensures silent operation and long life.

A range of standard contactors are now available ex-stock, other types available on short deliveries.

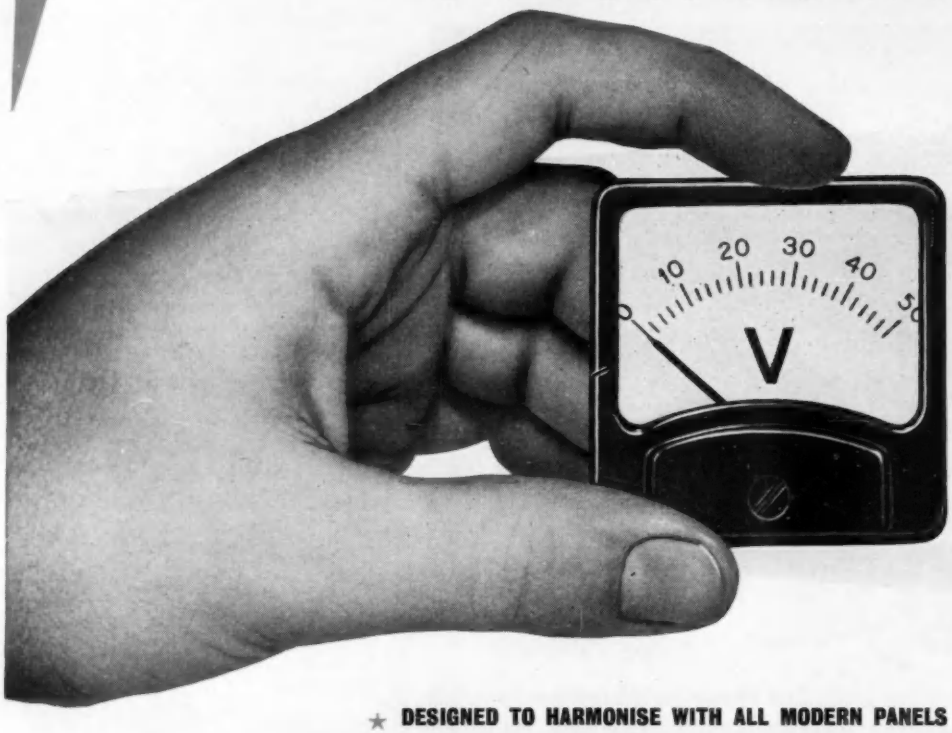
E. N. BRAY LIMITED

Control Gear Works, Britannia Road, Waltham Cross, Herts. Telephone: Waltham Cross 2212/3/4/5



Serving the electrical industry for more than 30 years

A NEW RANGE OF "Miniature"



Left:
2" square moving coil voltmeter

Right:
3" x 4" rectangular moving coil milliammeter

Below:
2½" round moving coil microammeter

★ **DESIGNED TO HARMONISE WITH ALL MODERN PANELS**

★ **FIXINGS CONFORM TO ACCEPTED PRACTICE**

★ **PRICES ARE HIGHLY COMPETITIVE**

For utmost reliability all 'ENGLISH ELECTRIC' miniature instruments have been designed with a higher-than-normal torque/weight ratio in combination with lower power consumption. All types have been successfully subjected to the following tests:

RESISTANCE TO IMPACT SHOCK OF 200g in any plane.
VIBRATION FATIGUE TEST—two million cycles at peak resonant frequency.
OSCILLATORY TEST—up to one million operations.

ENGLISH

THE ENGLISH ELECTRIC COMPANY LIMITED,
Meter, Relay and Instrument
WORKS: STAFFORD · PRESTON · RUGBY

INS. 39A8

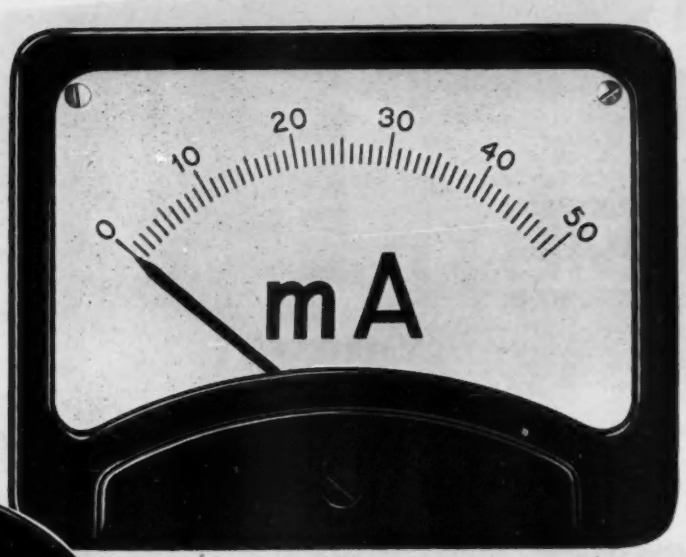
Instruments

SPECIFICATIONS
B.S. 89–1954 and other International Specifications.

TYPES
Moving coil for D.C. applications.
Rectifier moving coil for A.F. applications.
Thermo-couple operated moving coil for R.F. applications.

SIZES
Square: 2″, 2½″ and 3½″ nominal scale length.
Round: 2½″ and 3½″ nominal scale length.
Rectangular: 5″ x 6″ or 3″ x 4″ nominal case size.

Design registrations pending.



Over 50 standard ranges in any of the seven case types.

Delivery ex stock for standard ranges.

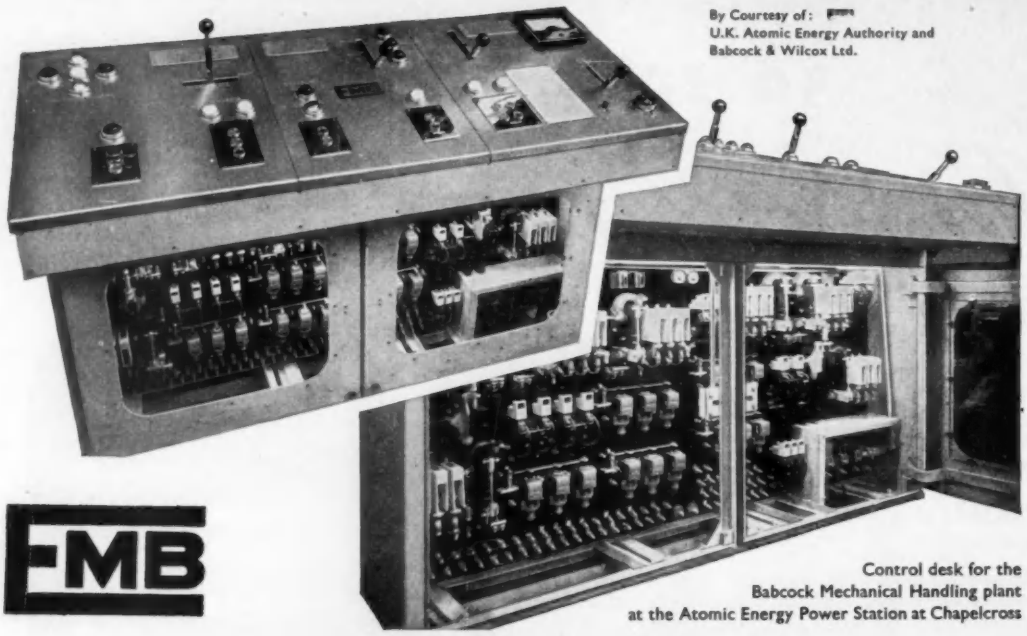
Non-standard ranges to customer's specification within 21 days.

Literature available on request to The ENGLISH ELECTRIC Company Limited, Instrument Department, Stafford

ELECTRIC'

MARCONI HOUSE, STRAND, LONDON, W.C.2
Division, Stafford
BRADFORD · LIVERPOOL · ACCRINGTON

By Courtesy of:
U.K. Atomic Energy Authority and
Babcock & Wilcox Ltd.



Control desk for the
Babcock Mechanical Handling plant
at the Atomic Energy Power Station at Chapelcross

EMB

at Chapelcross

E.M.B. Control Gear especially with MICROsen A.C. Speed control unit is being used to an ever increasing extent for Atomic Power Stations.

If the conditions are exacting there you will find E.M.B. equipment giving excellent service.

E.M.B. Co. Ltd.

WEST BROMWICH

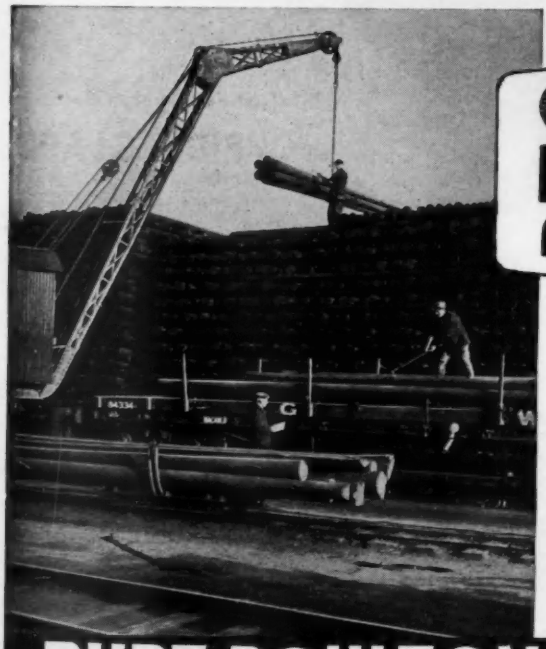
ENGLAND

A few words on '*Doc*'ility

Docility, according to our dictionary, means 'teachableness'—being able to be told ! Now, nobody resents being told, so long as the teller is sufficiently well-informed and, if you don't mind our mentioning it, 'Doc' (our scientific and technical paragon) is remarkably well-informed in matters concerning rubber. '*Doc*'ility, may we suggest, is a virtue which it would pay *you* to acquire: it means putting your problems to 'Doc' and letting him tell you the answers.
Saves you a lot of time.

JOHN BULL *Rubber*
Solves your problems

JOHN BULL RUBBER CO. LTD. (INDUSTRIAL SALES DIVISION) LEICESTER • TELEPHONE 36531



CREOSOTED POLES for POWER LINES

and
Telegraph Poles
Engineering and
Constructional Timber
of every description

BURT. BOULTON & HAYWOOD LTD.
BRETTENHAM HOUSE, WELLINGTON STREET, W.C.2.
Telephone. Temple Bar 5801 (5lines) Telegrams. Burboul, Rand, London.
Depots: LONDON
NEWPORT. SOUTHAMPTON Etc

"He's a very live wire"

they warned.

"I can keep him on the straight and narrow"—
Vidaflex sounded confident.

"Goes round and round in circles," they explained.

"Then I'll go with him—I'm really flexible." Vidaflex sounded keen.

"You might burn your fingers," they warned,
"he's a very hot customer in a very tight spot."

"His heat must be dissipated," Vidaflex said firmly
"and anyway, I'm flame-proof!"

"Will you wear make-up?" they asked curiously.

"A touch of silicone varnish, perhaps"
Vidaflex answered loftily.

At that there was a brilliant flash,
a puff of smoke—and a very
thoughtful electrical engineer
found himself holding a
braided sleeve of Vidaflex.
"I think this is just the job" he
announced to his testing bench.

Vidaflex flexible glass sleevings
are braided from **FIBREGLASS**
and made exclusively by
Jones Stroud and Company Ltd.

If you'd care to meet the whole family of

JONES STROUD sleevings

write for a catalogue to HIGHFIELD MILLS, CANAL ST., LONG EATON, NOTTINGHAM.

where copper saves the "brass"!

no drilling with Regent Busbar Chambers

INTERCHANGEABILITY permits **CHAMBER OF ANY LENGTH**, any polarity, any rating

DIRECT MOUNTING OF UNITS on to busbar chambers without support

FOR FASTER, EASIER INSTALLATION

MAXIMUM FLEXIBILITY

LOWEST INSTALLED COST

The twin copper bar assembly permits the use of solid copper, stranded or mineral insulated conductors to be connected to busbars instantly *without drilling!*

it's the *installed* cost that counts!

Regent Busbar Chambers by

Simplex

this man works for you . .

Simplex have a whole team of practical experts — whose job it is to help you with designing, building and advice on Simplex Switchboard installations. Write or telephone the Simplex Switchboard Service

Write for List SW2049

Simplex Electric Co Ltd Oldbury Birmingham

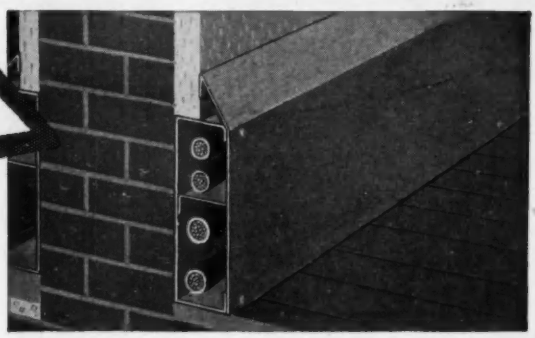
Branches throughout Britain and agents throughout the world

A COMPANY

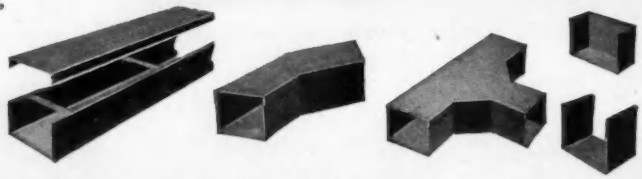
INSTALL CABLES EFFICIENTLY AND SPEEDILY with BRABY CABLE ACCESSORIES

BRABY perforated Cable Plates and Bends ensure speedy, simplified fixing OR removal of Cables. The plates and bends can be supplied in mild steel—self colour, painted, galvanized after manufacture or plastic coated. Also supplied in aluminium alloy.

BRABY mild steel Trunking protects and conceals cables.



BRABY Cable Accessories are particularly suitable for installations requiring frequent alteration and are widely specified for hospitals, factories, schools, cinemas, offices and in the shipbuilding industry.



Prices and leaflets giving fuller details on application.

ONE OF THE WIDE RANGE OF BRABY PRODUCTS

FREDERICK BRABY & COMPANY LIMITED

LONDON WORKS, THAMES ROAD, CRAYFORD, KENT. TELEPHONE: BEXLEYHEATH 7777

OTHER FACTORIES AT: Havelock Works, Aintree, Liverpool, 10. TELEPHONE: Aintree 1721
Eclipse Works, Petershill Road, Glasgow, N. TELEPHONE: Springburn 5151
Ashton Gate Works, Bristol, 3. TELEPHONE: Bristol 64041. And Falkirk

OTHER OFFICES: 352-364 Euston Road, London, N.W.1. (Head Office). TELEPHONE: EUSton 3456
110 Cannon Street, London, E.C.4 (Export). TELEPHONE: MANsion House 6034
Queen's Buildings, 10 Royal Avenue, Belfast. TELEPHONE: 26509
Palace Street, Plymouth. TELEPHONE: 62261

AP276

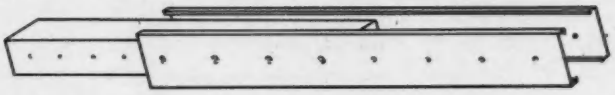
speed

rigidity

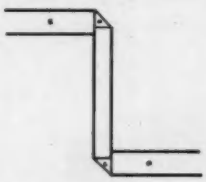
flexibility

adaptability

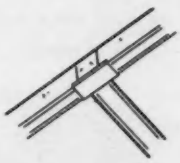
CRYSELCO TRUNKING is simple to assemble and very quick erection is possible by using the special suspensions. Two men working under normal conditions can erect several hundred feet of trunking in a day. Other electrical services can be carried in the wiring ducts on each side of the centre section. Additional fittings can be erected in a matter of minutes and the existing ones can be repositioned merely by loosening two screws.



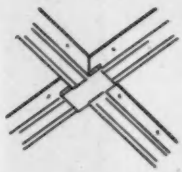
The overlap method of construction ensures fixings up to 18 ft centres



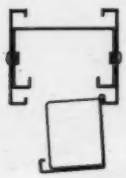
90° riser



T joint

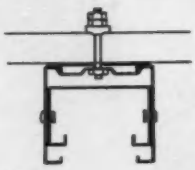


crossover



easy maintenance

easy assembly



easy erection

CRYSELCO TRUNKING LIGHTING SYSTEM

REDUCED INSTALLATION COSTS

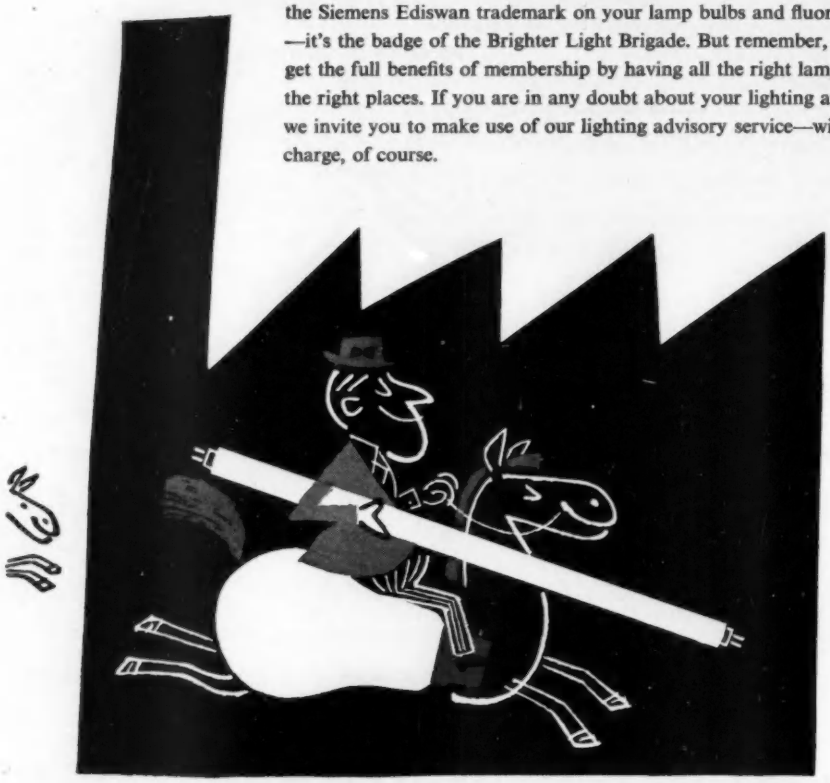
Details from

CRYSELCO LIMITED KEMPSTON WORKS BEDFORD

BRANCHES — BIRMINGHAM · BRISTOL · BURY ST. EDMUNDS · CARDIFF · GLASGOW · LEEDS
LEICESTER · LIVERPOOL · LONDON · MANCHESTER · NEWCASTLE · NOTTINGHAM · SOUTHAMPTON

Have you got the right lamps— in the right places?

In the very wide range of Siemens Ediswan lamps there is a 'best' type, size and power of lamp for every place and every purpose. It usually costs no more—and may often cost less—to fit the correct Siemens Ediswan lamp than to put up with a lamp or a fitting that is 'near enough'. Look for the Siemens Ediswan trademark on your lamp bulbs and fluorescent tubes —it's the badge of the Brighter Light Brigade. But remember, you only get the full benefits of membership by having all the right lamps in the right places. If you are in any doubt about your lighting arrangements, we invite you to make use of our lighting advisory service—without charge, of course.



Join the brighter light brigade

SIEMENS EDISWAN

SIEMENS EDISON SWAN LTD. *AN A.E.I. COMPANY*
Lamps and Lighting Division, 38/39 Upper Thames Street, E.C.4. and branches. Telephone: CENtral 2332

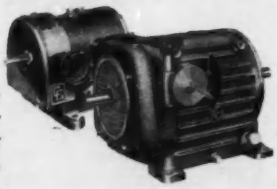
CRC11/31

Infinitely Variable Speed

. . . . with sensitive accurate control

By adjusting a conveniently placed handwheel, the speed of this Wire Coiling Drive can be accurately controlled to suit the wire gauge.

Built by the Unity Engineers Ltd. and installed at the Sowerby Bridge works of The Standard Wire Co., the above drive includes Size 3A Carter Hydraulic Variable Speed Gears fitted with flange mounted reduction gears.



For full details of the entire fractional up to 35 horsepower range of Carter Hydraulic Variable Speed Gears, write for folder 358.

Carter Gears Limited

BRADFORD 3
YORKSHIRE
ENGLAND

'phone: Bradford 64378 (3 lines)
'grams: 'Became' Bradford Telex

G. A. RIX

KEIGHLEY • ENGLAND

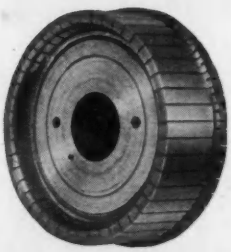
Telephone: 2420

Telegrams: Rix, Keighley

COMMUTATORS

Commutators of all sizes, built to Manufacturers' specifications in large or small quantities.

Other Specialities include
Rebuilding large commutators
Rewinds • Coils
Armatures



for
Motors, Generators and Auto-Electrical Equipment

H

TRANSFORMERS

FOR DISTRIBUTION AND INDUSTRY

Rectification for D.C. equipment · Testing units (1 or 3 ph.) with multiple tapping switch · Isolating transformers for electrical tools · Transformers for electronic equipment up to 30 kV · All industrial requirements up to 250 kVA.

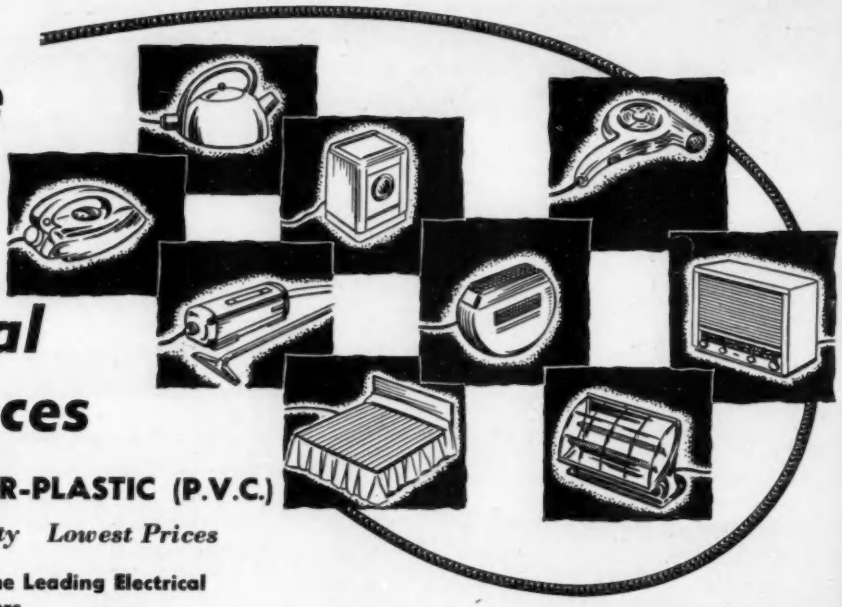
Our transformers comply with all relevant B.S. specifications.

25 kVA rectifier unit for 12,000 v. D.C.

S.T.L. *Transformers are widely used in industry where reliable units are required for continuous duty.*

STEWART TRANSFORMERS LTD.
Kilburn Lane London W.10 Tel. LADbroke 2296/7

Flexible leads for all Electrical appliances



BRAIDED-RUBBER-PLASTIC (P.V.C.)

Highest Quality Lowest Prices

Suppliers to most of the Leading Electrical Appliance Manufacturers

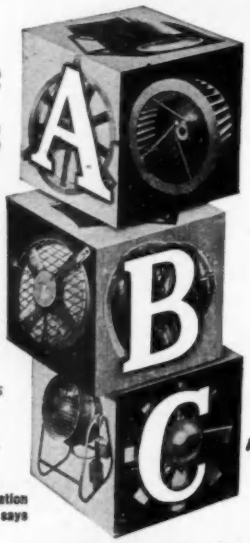
LPS INSULATED WIRES AND CABLES

L.P.S. ELECTRICAL CO. LTD., ST. LEONARDS-ON-SEA, SUSSEX

LONDON SALES OFFICE: 122 DRURY LANE, W.C.2 Telephone: Hastings 7061, Covent Garden 3231

Grams: Engineyor, Phone, London

Simple as



to select the right FAN

The STANDARD AXIALS range from 12" to 27": the STANDARD CENTRIFUGAL range includes forward curve, backward curve and paddle blade.

An Airscrew Specification means what it says

Airscrew can provide the right fan at the right time from their Standard range of Axial Flow and Centrifugal Fans. The Airscrew Technical Service is ready to assist in fan selection from the Standard ranges or by special design when required.
Every Airscrew fan is guaranteed to give its rated duty.

AIRSCREW STANDARD FANS

THE AIRSCREW CO. & JICWOOD LTD., WEYBRIDGE, SURREY Weybridge 2242/7

for Electrical Insulation

VULCANISED FIBRE

LEATHEROID

EBONITE

BAKELITE *(Fabric & Paper Base)*

of every type

The largest and most comprehensive range of insulating materials in the country. Supplied in sheet, rod and tube form

We can offer machined and pressed parts to your requirements in most types of Insulating Material. You will find our prices and service extremely competitive. Your enquiries will receive our prompt and careful attention.

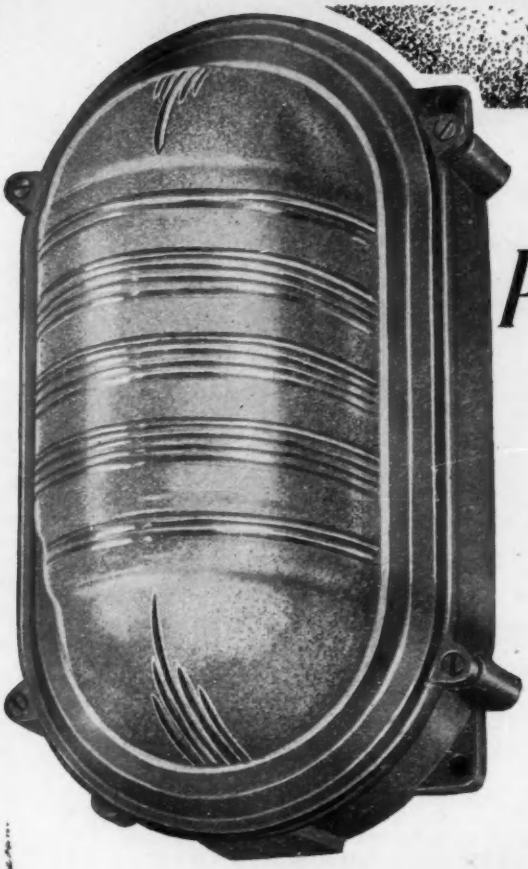
Also **Turned and Pressed Parts**

HEAVEN, DOWSETT & Co Ltd.

INSULATION HOUSE, 315 WELLINGTON ROAD
BIRMINGHAM 20
Phone: BIRchfield 6218-9 *Grams:* Fibre B'ham 20

COUGHTRIE

PRISMATIC FITTINGS



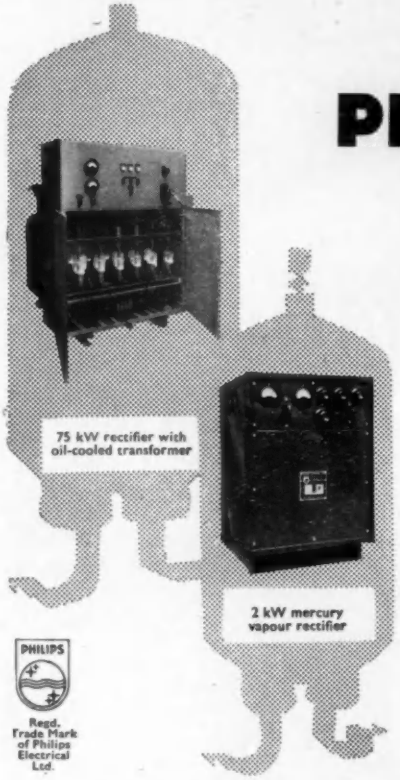
List No. SP.10
100/150 Watt.

Stocked by all leading Electrical Wholesalers

List No. SP.6.
60/100 Watt.

CATALOGUE AVAILABLE ON REQUEST

MANUFACTURED AT **HILLINGTON, GLASGOW, S.W.2**
by **J. & G. COUGHTRIE Ltd.**


75 kW rectifier with oil-cooled transformer
2 kW mercury vapour rectifier
PHILIPS
Regd. Trade Mark of Philips Electrical Ltd.

PHILIPS Electronic Rectifiers

for industrial and laboratory use

- 500 W—75 kW
- Single anode mercury vapour bulbs
- No moving parts—minimum maintenance

Leaflet PI 4474, giving details of standard range of Philips Electronic Rectifiers, gladly sent on request.

Rectifiers can also be made to individual requirements, e.g. to fit in with site conditions. Our engineers will visit your premises and advise without obligation on suitable equipment.
Please contact:–

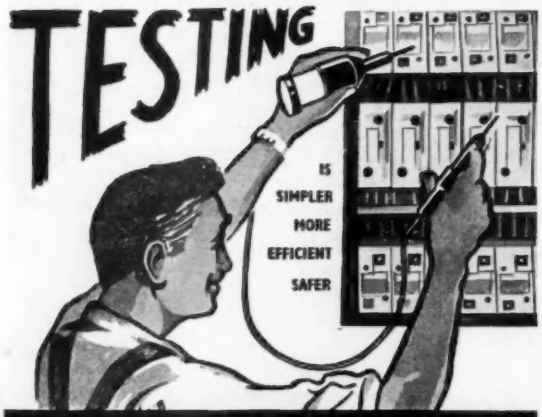
Sole Distributors in U.K.

RESEARCH & CONTROL INSTRUMENTS LTD

Instrument House · 207 King's Cross Road · WC1
Telephone: Terminus 8444

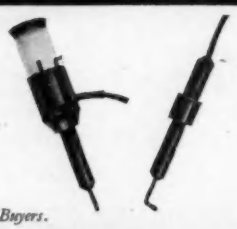
(RCL0371)

TESTING



WITH THE **Indestructible** MEDIUM VOLTAGE ALL INSULATED **TEST LAMP**

- 100/500 Volts A.C./D.C.
- Moulded Rubber End Cap and Body.
- Opal Perspex Tube protecting lamp.
- Angled and straight interchangeable Steel Prongs.
- H.R.C. Fuses in each Prod.



Prices :
Type MTL3 (shown) 35/-
Type MTL1 (with fixed prods) 30/-

Special Terms to Wholesalers and Large Buyers.

JOHN DRUMMOND (ENGINEERS) LTD.
Bellcrag Works, Dalsholm Road, Glasgow N.W.
Tel: MARyhill 3315

RODENE TIMERS

FOR MOST AUTOMATIC CONTROL NEEDS!

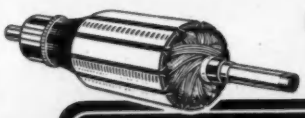
The "Rodene" high torque instant start, synchronous Timer-Motor with built-in automatic clutch.

Self-reset and Multi-cam Timers.

Made in England.

SEND FOR LIST R.1.

D. ROBINSON & CO. Tel: Hounslow 6266/7
717 LONDON ROAD, HOUNSLOW, MIDDX.

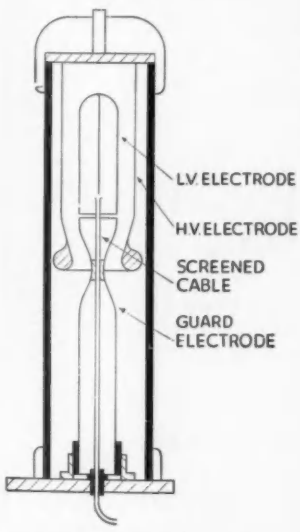


ELECTRIC MOTOR REPAIRS
FHP – 500 hp A.C. & D.C.

J. B. ELECTRIC LTD.
197/199 Manchester Rd., Broadheath
Altrincham . Cheshire
Phone: Altrincham 2146

TRANSFORMER REWINDS
10–3,500 K.V.A.
Estimates free – All work guaranteed.
Reconditioned Motors ex stock – Reconditioned Transformers to suit your requirements
WRITE FOR DETAILS

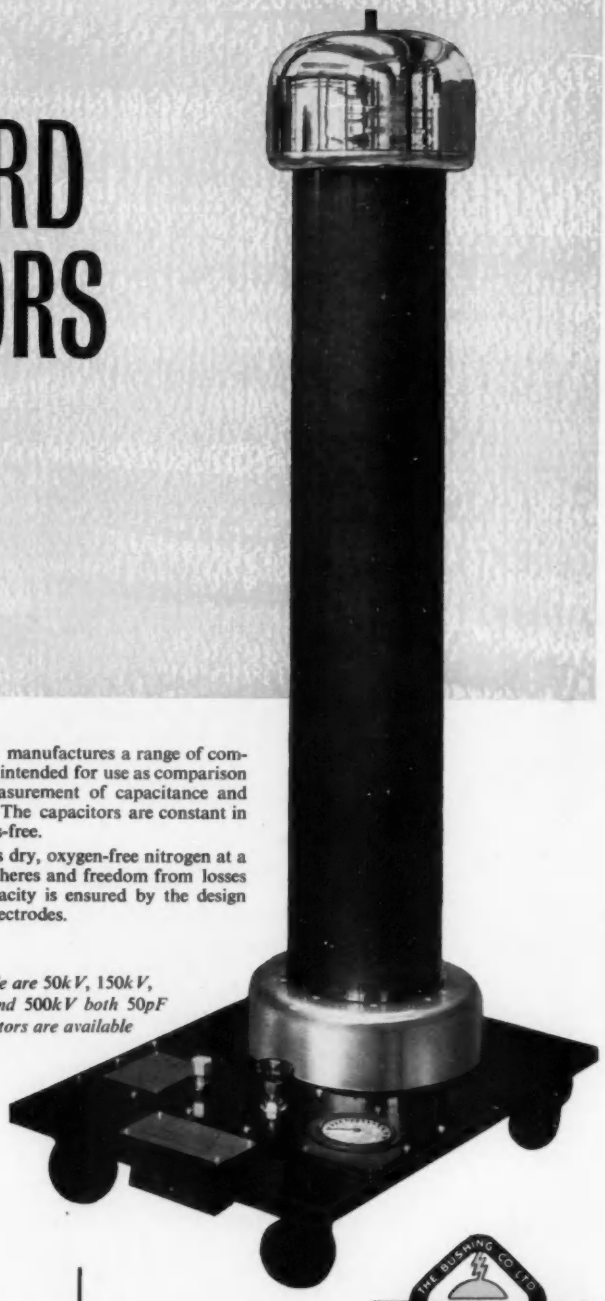
STANDARD CAPACITORS



The Bushing Co. Ltd. manufactures a range of compressed gas capacitors intended for use as comparison standards for the measurement of capacitance and dielectric loss factor. The capacitors are constant in value and virtually loss-free.

The gaseous insulant is dry, oxygen-free nitrogen at a pressure of 10 atmospheres and freedom from losses and invariance of capacity is ensured by the design and screening of the electrodes.

The sizes available are 50kV, 150kV, 200kV, 300kV and 500kV both 50pF and 100pF capacitors are available in each size.



THE BUSHING COMPANY LTD.
HEBBURN-ON-TYNE, ENGLAND

Telephone: HEBBURN 83-2241
Grams: "BUSHING HEBBURN"

TEXOLEX
THE BUSHING CO LTD
HEBBURN ON TYNE

H*

PHILIPS

Free Lighting Design Service...

can sell more for you, too!

Sound, planned *lighting makes your premises look more attractive and increases sales!*

And the Philips Lighting Design Service is ready and waiting to plan the right lighting for *you* — without charge or obligation. So let imaginative lighting sell for you, too — get in touch with the Philips Lighting Design Service either direct or through your electrical contractor.

For further information and lighting design enquiries contact your local Philips Branch or ring GERrard 7777.

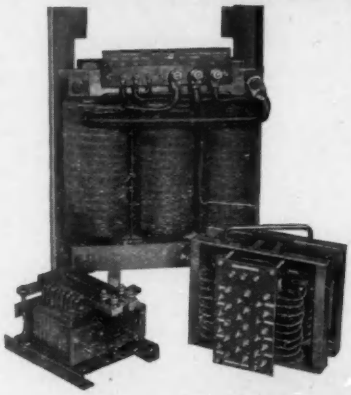
PHILIPS

PHILIPS ELECTRICAL LTD LIGHTING DIVISION

CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON · W.C.2
(LD3042)

"Colne" TRANSFORMERS

Range 20 VA to 20 kVA
to appropriate B.S.S.



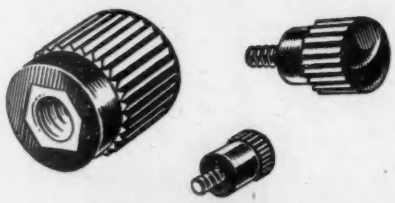
We invite your enquiries.

Manufactured by

Colne

SWITCHGEAR (K & W) LTD.
formerly Electrical Products (Colne) Ltd.
Walton Street, Colne, Lancs.
Phone: Colne 1394/5

TERMINAL NUTS



A wide range of sizes in black or colours with many different threaded male or female inserts

Litholite Plastic Moulders since 1901

LITHOLITE Insulators & St. Albans MOULDINGS LTD.
Sandown Road, WATFORD, Herts. Tel. WATFORD 4494

MONMORE CONDUITS

The Finest Quality no matter where you look . . .

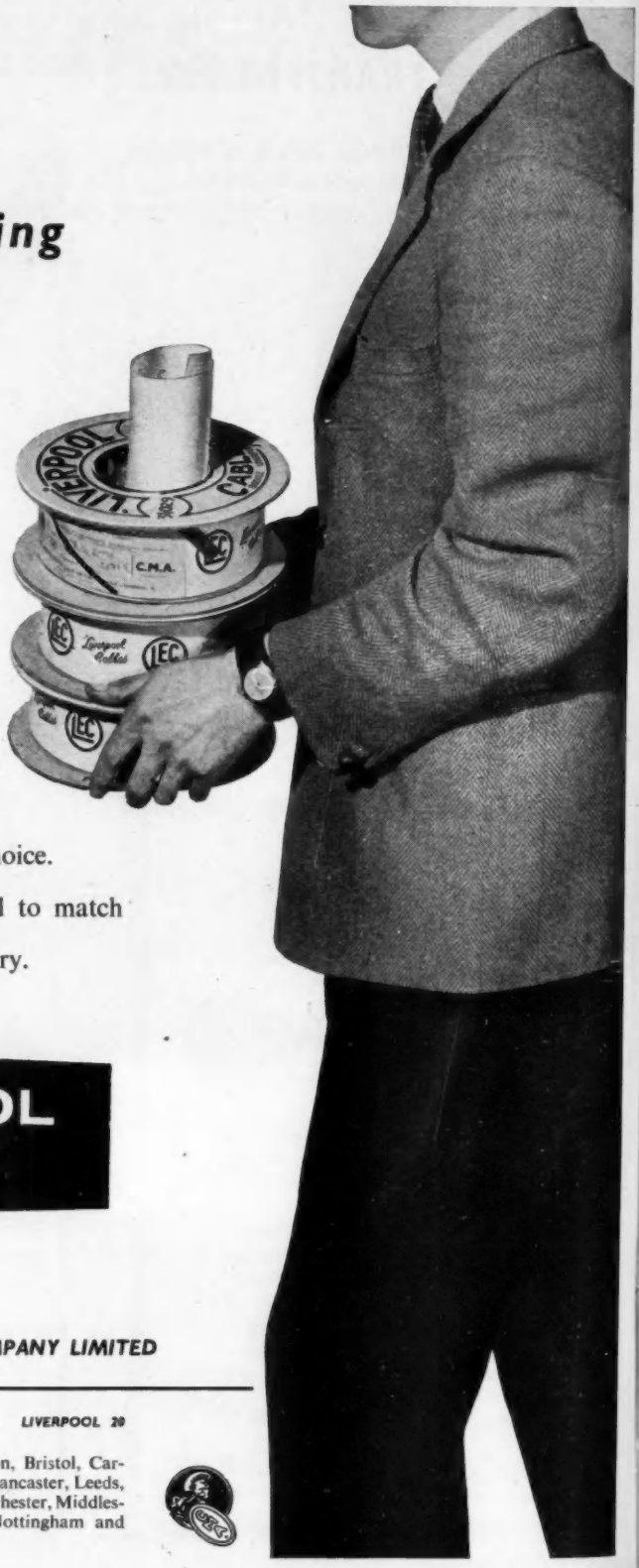
speedy delivery too!

IN DUCTILE STEELS GROUP

MONMORE CONDUITS LTD

WOLVERHAMPTON Telephone : 27091 (5 lines)

only ordered the cable this morning



Urgent orders — large or small — can be met from stocks at the local branch office, and prompt delivery is assured.

Whatever the size of the installation, from a reel of flex to a large electrical contract, make Liverpool Cables the first choice. Good, dependable cables developed to match the requirements of modern industry.

LIVERPOOL CABLES

THE LIVERPOOL ELECTRIC CABLE COMPANY LIMITED

LINACRE LANE • BOOTLE • LIVERPOOL 20

Branches at: Birmingham, Brighton, Bristol, Cardiff, Edinburgh, Exeter, Glasgow, Lancaster, Leeds, Leicester, Liverpool, London, Manchester, Middlesbrough, Newcastle upon Tyne, Nottingham and Reading

Regional Guide to

ELECTRICAL CONTRACTORS

LONDON

Industrial, Commercial and Housing Installations
Factory Maintenance. Motor Rewinds
EDWARDS, WYATT & COURT (Installations) LTD.
70/72 Whitwell Road, E.13
Telephone: ALBert Dock 5295/6/7

J. G. SNEATH LTD.
Wallwood Street, Limehouse, E.14
Telephone: EASt 2428-9
Rewinds and Repairs. Industrial Installations

Motor and Generator Repairs and Rewinds, Lighting and Power Installations. Factory Maintenance Contracts.
COLLINS ELECTRICAL LTD.
115 Clerkenwell Road, E.C.1
Telephone: HOLborn 0212-3-4 & CANonbury 3227-8

Lighting, Heating and Power Installations. Factory Maintenance and Motor Stockists
C. J. FERGUSON & SONS LTD.
33 Barbican, London, E.C.1
Telephone: MONarch 5474-5

Industrial Installations. Power, Heating and Lighting. Factory Maintenance. Electrical Engineers. Break-down Specialists
F. A. ORRICK & CO. LTD.
157 Camberwell Road, S.E.5
Telephone: RODney 5548

BARLOW & YOUNG LTD.
55 Catherine Place, Westminster, S.W.1
Telephone: VICtoria 7373
Installations of all Types

BERKELEY ELECTRICAL ENG. CO. LTD.
Vincent House, Vincent Square, S.W.1
Telephone: VICtoria 8051
Electrical Engineers and Contractors

H. J. CASH & CO. LTD.
Caxton House, Tothill Street, S.W.1
Telephone: WHitehall 4774
Electrical Engineers and Contractors

DRAKE & GORHAM (Contractors) LTD.
36 Grosvenor Gardens, Westminster, S.W.1
Telephone: SLOane 0121
Electrical Engineers and Contractors

EDMUNDSONS CONSTRUCTION CO. LTD.
Electrical Engineers and Contractors
24-30 Gillingham Street, S.W.1
Telephone: VICtoria 1713

One of the Largest Electrical Contractors in the Industry
ELECTRICAL INSTALLATIONS LTD.
65 Vincent Square, Westminster, S.W.1
Telephone: VICtoria 2266 (10 lines)

. . . for all electrical installations
F. H. WHEELER & CO. LTD.
39 Victoria Street, S.W.1
Telephone: ABBey 8080 (8 lines)

TROUGHTON & YOUNG LTD.
2 Basil Street, London, S.W.3
Telephone: Kensington 3444
Electrical Engineers and Contractors

BURDETTE & CO. LTD.
150 Clapham Manor Street, S.W.4
Telephone: MACaulay 4555
Industrial Installations. Motor and Generator Repairs. Metallizing Treatments. Complete Electrical Maintenance. Heating and Ventilating.

WILSON ELECTRIC (BATTERSEA) LTD.
122a, Clapham Manor Street, S.W.4
Telephone: MAC 6768 & 3737
Electrica Engineers and Contractors. Motor Rewinds and Repairs. Installations. "Delco" Electric Motors—Approved Stockists and Repairers.

Industrial Installations throughout the Country. Power, Maintenance and Insurance
CITY ELECTRICAL CO.
Emerald Street, W.C.1 *Telephone: HOL. 9722 (6 lines)*
Repairs and Rewinds—Motor Stockists

A. TINDALL & SONS
22 Rosemary Avenue, Enfield
Electrical Engineers and Contractors
Telephone: ENField 6612 (3 lines)

F. W. BLANSHARD LTD.
23 Lansdowne Road, Purley, Surrey
Telephone: Uplands 4818, 4819 & 4810
Complete electrical installations. Rewinding and repair of motors and transformers. Manufacturers of control gear for fluorescent.

SERVICE ELECTRIC CO. LTD.
Secomak Works, Honeypot Lane, Stanmore, Middx.
Telephone: EDGware 5566-7-8-9
Electrical Installations of every kind. Motor Rewinds. Factory Maintenance

DYNAMO & MOTOR REPAIRS LTD.
North End Road, Wembley Park
Telephone: Wembley 3121
Motor and generator repairs and rewinds. Installations and factory maintenance. Electrical plant stockists

SOUTH EASTERN

GALLIERS
32 St. James's Street, Brighton
Telephone: Brighton 23201-2-3
Farm and Dairy Electrical Equipment

Electrical, Refrigeration and Radio Engineers. Installation Contractors. Lifts. Television
H. BENEY & SONS LTD.
99 South Street, Eastbourne
Telephones 4820.1 (Day and Night)

For first-class A.C. and D.C. Rewinds and Industrial Plant Maintenance
ELECTRICAL POWER REPAIRS (Gillingham) LTD.
Strover Street, Gillingham, Kent
Telephone: Gill. 5200 & 59356 (Day and Night)

Heavy Engineering and Electrical Contracting
DRAKE & FLETCHER LTD.
Maidstone, Kent
Telephone 2284
Refrigeration. Oil Heating and Drying Installations

F. W. BLANSHARD LTD.
23 Lansdowne Road, Purley, Surrey
Telephone: Uplands 4818, 4819 & 4810
Complete electrical installations. Rewinding and repair of motors and transformers. Manufacturers of control gear for fluorescent.

SOUTHERN

GOATER & MEDWAY LTD.
Electrical Engineers
121 Commercial Road, Southampton
Telephone 21440
Cable Jointing. Cable Laying. By Direct Contract and to the Trade.

. . . for all electrical installations
F. H. WHEELER & CO. LTD.
32 Brassey Road, Winton, Bournemouth
Telephone: Winton 1609

. . . for all electrical installations
F. H. WHEELER (Southern) LTD.
Clifton Hall, Oakley Road, Shirley, Southampton
Telephone 73967

SOUTH WESTERN

. . . for all electrical installations
F. H. WHEELER (Bristol) LTD.
55 Queen Charlotte Street, Bristol 1
Telephone 26907

CLARKE BROS. (Stroud) LTD.
Bath Road, Stroud
Telephone: Stroud 1132/3
Electrical Engineers and Contractors
Rewinds and Repairs. Industrial Installations

EASTERN

Norwich..... Cambridge..... Gt. Yarmouth..... Lowestoft..... Ipswich
EASTERN & HOME COUNTIES ELECTRICAL CONTRACTORS
Specialists in Large Scale Electrical Installation Contracts.
Electra House, Southtown Road, Gt. Yarmouth
Telephone: Gt. Yarm. 2390

EAST MIDLANDS

Electrical Engineers and Contractors
C. A. J. BILLINGTON LTD.
Cranfield, Bedfordshire
Telephone: Cranfield 293
Industrial Installation throughout the Home Counties

(Continued on page 106)

(Continued from page 105)

MIDLANDS

WALKER BROS. (ELECTRICAL ENGINEERS) LTD.
Quality House, Temple Row, Birmingham 2
Telephone: CEN. 7611/5
Electrical Installation Engineers. Industrial Installation Specialists
Established 1895

HARRIS & SHELDON LTD.
31 Stafford Street, Birmingham 4
Telephone: Central 7101
For all electrical contracting installations, lighting, heating, power, public address, etc.

Electrical and Mechanical Engineers, Factors
THE BIRMINGHAM POWER TRANSMISSIONS LTD.
117/118 Snow Hill, Birmingham 4
Telephone: AST. 2088-9

. . . for all electrical installations
F. H. WHEELER & CO. LTD.
553 Moseley Road, Birmingham 12
Telephone: Calthorpe 2601-2

DYNAMO & MOTOR REPAIRS LTD.
Belgrave Terrace, Soho Road, Birmingham 21
Telephone: Northern 0898
Motor and generator repairs and rewinds. Installations and factory maintenance. Electrical plant stockists

For Electrical Installations of Quality consult:
HAROLD F. WARD LIMITED
Birmingham 28
Telephone: VIC 4041 (5 lines)

ELECTRICAL INSTALLATIONS LTD.
Faraday Works, Stoney Stanton Road, Coventry
Telephone 2970
Industrial Electrical Work of All Kinds. Over 40 Years' Experience

G. G. WALKER & CO. (Dudley) LTD.
31 Hall Street, Dudley
Telephone 4474/5
Rewinds, Lighting, Power, Electric Furnace, Electronic Installations and Maintenance. Television and Radio. Est. 40 years. E.C.A. Members

SOUTH WALES

CLARKE BROS. (Stroud) LTD.
Green Park Street, Aberavon
Telephone: Port Talbot 791
Electrical Engineers and Contractors
Rewinds and Repairs. Industrial Installations

DRAKE & GORHAM (Contractors) LTD.
13 St. Andrew's Crescent, Cardiff
Telephone: Cardiff 32080
Electrical Engineers and Contractors

. . . for all electrical installations
F. H. WHEELER & CO. LTD.
117 Woodville Road, Cardiff
Telephone 21281-2 *Telegrams: "Whelect"*

CLARKE BROS. (Stroud) LTD.
High Street, Merthyr Tydfil
Telephone: Merthyr Tydfil 377
Electrical Engineers and Contractors
Rewinds and Repairs. Industrial Installations

MERSEYSIDE & N. WALES

TROUGHTON & YOUNG LTD.
46 Rodney Street, Liverpool 1
Telephone: Royal 9231-2
Electrical Engineers and Contractors

H. J. CASH & CO. LTD.
28 Chapel Street, Liverpool 3
Telephone: Central 0452
Electrical Engineers and Contractors

YORKSHIRE

Electrical Engineers and Contractors
SOUTHERN & REDFERN LTD.
Woodhead Road, Bradford 7
Textile Maintenance, Repairs and Rewinds
Telephones: Bradford 23871—Late Phone: Bradford 65837

EDMUNDSONS CONSTRUCTION CO. LTD.
Electrical Engineers and Contractors
2 Hartley Hill, Leeds 2
Telephone: Leeds 33791

. . . for all electrical installations
F. H. WHEELER & CO. LTD.
44 Bank Street, Sheffield 1
Telephone 24015 (3 lines) *Telegrams: "Whelect"*

NORTH WESTERN

H. J. CASH & CO LTD.
28 Chapel Street, Liverpool 3
Telephone: Central 0452
Electrical Engineers and Contractors

STEWART THOMSON & SONS (Liverpool) LTD.
Fort Road, Seaforth, Liverpool 21
Repairs and Rewinds A.C. and D.C. to 3,000 horsepower. Breakdowns, Urgent Repairs, etc. 24-hour service
Telephone: Bootle 2697-8

DRAKE & GORHAM (Contractors) LTD.
21 Newton Street, Piccadiliy, Manchester 1
Telephone: Manchester Central 4701
Electrical Engineers and Contractors

. . . for all electrical installations
F. H. WHEELER & CO. LTD.
Regal Buildings, Oxford Road, Manchester 1
Telephone: Central 8207-8

Industrial Installations
W. H. SMITH & CO. ELECTRICAL ENGINEERS LTD.
12 York Street, Manchester 2
Telephone: CENtral 2991-6
Works: Praed Road, Trafford Park, Manchester 17

THE NELSON ENGINEERING CO. LTD.
Telephone: Nelson 1545/6
Electrical and Mechanical Engineers.
Complete Industrial Installations. Rewinds
Netherfield Road, Nelson

EDWARD DEWHURST LIMITED
Mount Street Works, Preston
Telephone : Preston 3281
Electrical and Mechanical Engineers, Complete Industrial Installations, Rewinds, Factory Maintenance, Special Switchboards, etc.

NORTH EASTERN

. . . for all electrical installations
F. H. WHEELER & CO. LTD.
52 Elswick Road, Newcastle
Telephone: Newcastle 36271

Applications for particulars of costs and standard style of advertisements in this Regional Guide should be addressed to :

THE
ADVERTISEMENT DEPARTMENT,
ELECTRICAL REVIEW,
DORSET HOUSE, STAMFORD STREET,
LONDON, S.E.1

LEONARD HEYS BLACKPOOL

for EVERYTHING ELECTRICAL by the best makers

(WHOLESALE ONLY)

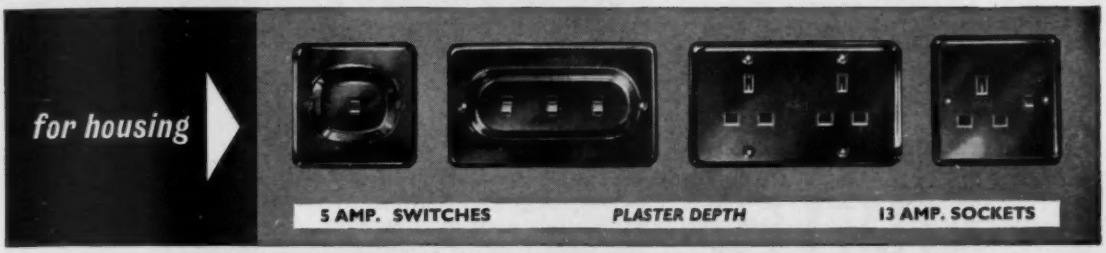
Prompt and personal attention. Deliveries throughout LANCASHIRE by our own vans (elsewhere by B.R.S.)

CMA and other CABLES; MEM SWITCHGEAR; CONDUIT and all WIRING SUPPLIES; FHP MOTORS; LIGHTING, HEATING and DOMESTIC APPLIANCES; BLACK & DECKER and BRIDGES ELECTRIC TOOLS, etc.

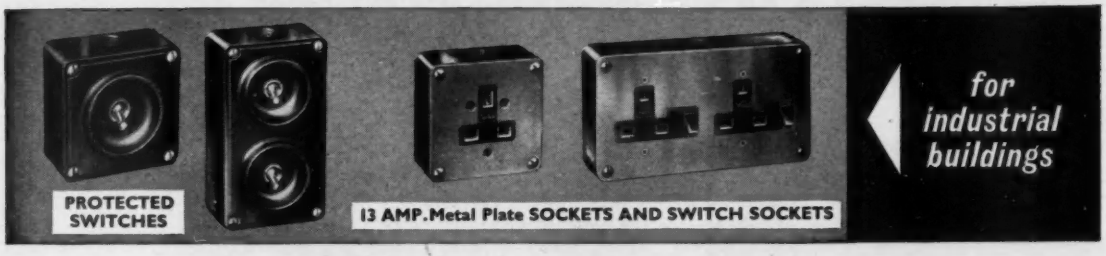
We carry good stocks; enquiries welcomed.

LEONARD HEYS LTD. (Elec rical Division)
CASTLEGATE, LYTHAM ROAD, BLACKPOOL.
Phone 28364. Grams: HEYS BLACKPOOL (TELEX). Telex No. 67-636.

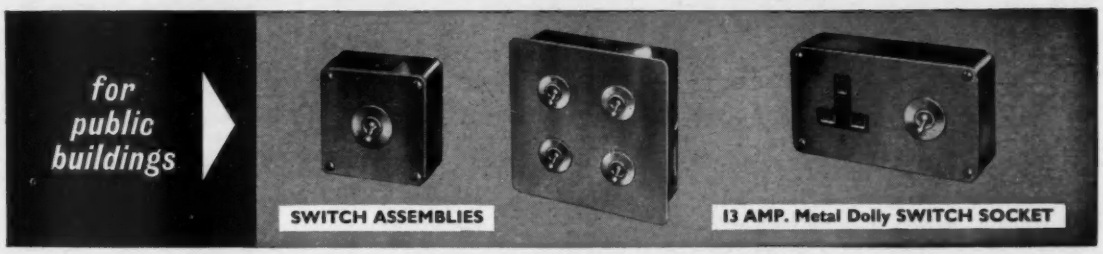
Volex makes the point...



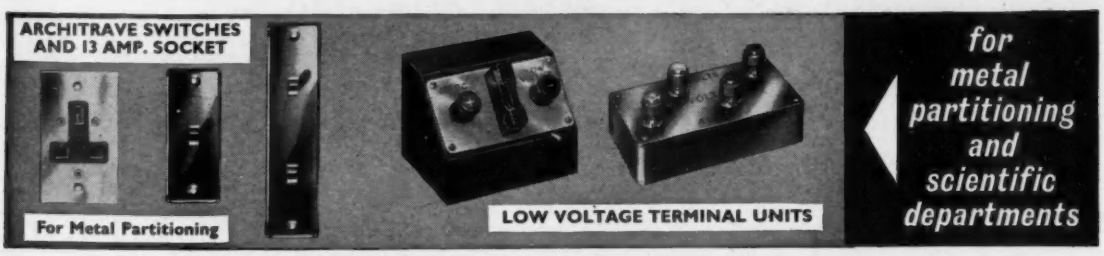
... used by Public Authorities and Government Bodies



... specified by Architects and Consultants



... approved by Contractors everywhere

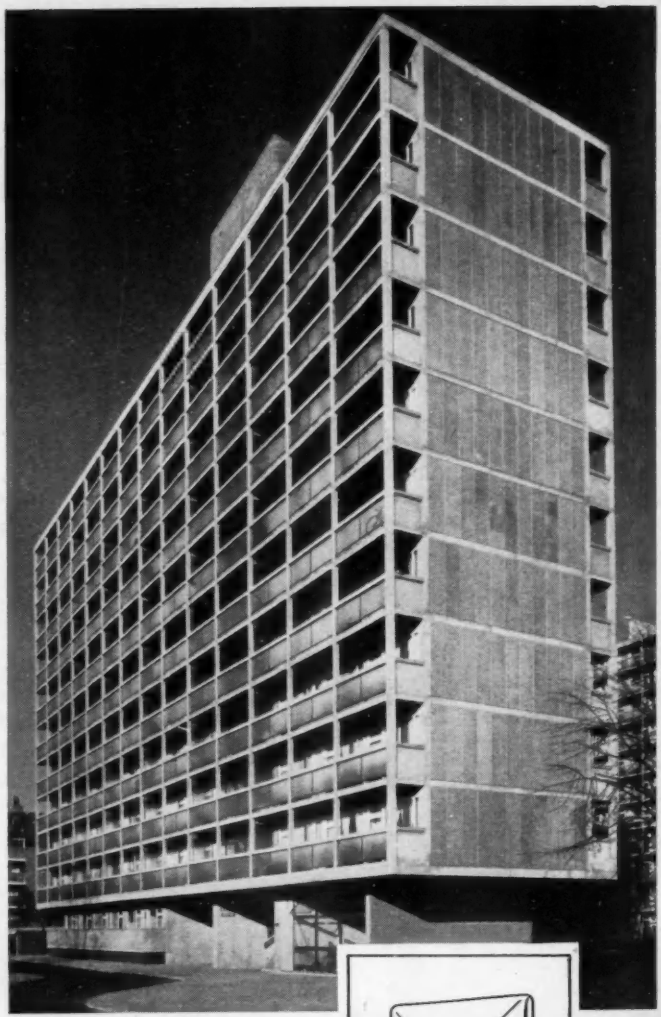

ARCHITRAVE SWITCHES AND 13 AMP. SOCKET
For Metal Partitioning
LOW VOLTAGE TERMINAL UNITS
for metal partitioning and scientific departments

Send for Illustrated Catalogue giving full details

VOLEX ELECTRICAL PRODUCTS LTD.

Telephone : PENDLETON 4373 SALFORD 6 Telegrams : VOLEXPROD. Salford 6

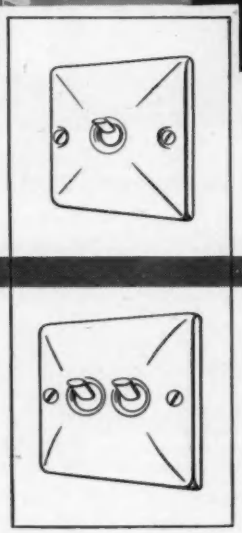
WHEN THE LIGHTS GO ON IN LAMBETH



Many do so at the touch of Mutac Silent A.C. Switches in several blocks on the new L.C.C. Loughborough Road Estate. Mutac Switches are also in use on numerous other L.C.C. projects.

London County Council:
Former Architect to the Council
Professor Sir Leslie Martin.

Engineering Services:
Joseph Rawlinson, Esq., C.B.E., M.Eng., M.I.C.E., M.I.Mech.E.
Chief Engineer to the L.C.C.



MUTAC

SILENT A.C. FLUSH SWITCHES

Main Contractors:
Tersons Ltd.

Electrical Sub-Contractors:
Haines & Sheppard Ltd.

G.E.C PRODUCTS

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to First Post on Monday of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

SEDGLEY URBAN DISTRICT COUNCIL

Street Lighting

TENDERS are invited from competent Electrical Contractors for the provision of Group A and B lighting on various roads within the Urban District, as follows:—

GOSPEL END ROAD: Scheme I. Provision and erection of 30 Concrete Columns, 25 ft., with 250-watt Mercury Discharge Lamps complete.

Scheme II. Provision and erection of 7 similar lighting points.

DISTRICT ROADS GOLDTHORN PARK AND LOWER GORNAL: Provision and erection of 25 Concrete Columns, 15 ft. high, with 80-watt Fluorescent Mercury Lamps complete.

DISTRICT ROADS SEDGLEY AND UPPER GORNAL: Fit suitable brackets to existing gas columns or take down gas columns and re-erect, and fit brackets and 80-watt fluorescent lamps complete to a total number of 22.

Conditions of contract, specification and form of tender may be obtained from W. M. Jones, Esq., B.Sc., A.M.I.C.E., Engineer and Surveyor, The Limes, Sedgley, on application accompanied by £2 2s. deposit, refundable on receipt of a bona fide tender, not subsequently withdrawn, or acceptable reasons being given for not tendering.

The above documents will be available on or after Thursday, 2nd October, and tenders must be returned to the undersigned not later than Monday, October 13th, 1958.

The Council does not bind itself to accept the lowest or any tender.

K. R. F. NEWTON,
Clerk and Solicitor to the Council.

Council. House,
Sedgley.
September, 1958. 4985

COUNTY OF CORNWALL

APPLICATIONS are invited from Electrical Contractors for permission to tender for the ELECTRICAL SERVICES Sub-Contract in connection with the erection of a new COUNTY SECONDARY SCHOOL at HELSTON.

Applications should be made to the County Architect, County Hall, Truro, not later than SATURDAY, 11th OCTOBER, 1958, from which a selected number of firms will be invited to tender.

The closing date for receipt of tenders will be notified when the documents are despatched.

The lowest or any tender will not necessarily be accepted nor will the County Council pay to contractors any fees or expenses incurred in the preparation of tenders.

E. T. VERGER,
Clerk of the County Council.

County Hall, Truro.
25th September, 1958. 4973

METROPOLITAN BOROUGH OF LEWISHAM

Main Street Sodium Vapour Lighting

TENDERS are invited for:—
(1) Supply of 107 Group A Steel Columns.
(2) Supply of 158 Lanterns and control gear.
(3) Supply of 158 140-watt Lamps.
(4) Work of erection, resiting and conversion.

Further particulars and forms of tender from Borough Engineer, Lewisham Town Hall, Catford, London, S.E.6. (Please state items in which interested.)

Closing date 10 a.m. Monday, 20th October, 1958. 4956

BOROUGH OF STRATFORD-UPON-AVON

Winchester-Preston and Bath-Lincoln Trunk Roads

Street Lighting

TENDERS are invited for the erection and wiring only of 61 25-foot Steel Columns and the supply and fixing of 61 Lanterns for 500-watt Tungsten Lamps with time switches, fuses, etc.

Specifications, bills of quantities and forms of tender may be obtained from the undersigned on payment of a deposit of £2 2s., which will be returned on receipt of a bona fide tender.

Tenders must be delivered to the Town Clerk, 2, Sheep Street, Stratford-upon-Avon, not later than noon on 16th October, 1958.

Tenders must be submitted on a fixed price basis and the Council do not bind themselves to accept the lowest or any tender.

P. C. SMART, M.I.C.E.,
Borough Engineer and Surveyor.

Municipal Offices,
Stratford-upon-Avon.
22nd September, 1958. 4946

SITUATIONS VACANT

AIR MINISTRY

STATION ENGINEERS (G.D.) and STATION ENGINEERS (Mech.) required at R.A.F. and M.T.C.A. Stations. Qualifications required: (a) O.N.C. Elec. or Mech. or equivalent; (b) recognised apprenticeship in electrical or mechanical engineering with firm or establishment of good repute; (c) 3 years' employment in electrical or mechanical engineering, preferably on operation and maintenance of mine, factory or workshops plant and services. Preference given to candidates with supervisory experience subsequent to (b) and (c).

Work consists of installation, operation and maintenance of high and medium-voltage electrical distribution system electrical installation, generating plant, steam and hot water heating systems and miscellaneous works plants, tools and equipment.

Commencing salary according to age, qualifications and experience on range £655-£820. Promotion and pensionable prospects and opportunities for overseas tours for which special allowance payable in addition to higher salary.

Applications normally from natural-born British subjects only, up to age 45 years.

Write giving age, full details of qualifications and experience, quoting (PE.3140), to Manager, Ministry of Labour and National Service, Professional and Executive Register, Atlantic House, Farringdon Street, London, E.C.4. 391

ENGINEER FOR TECHNICAL ENGINEERING DEPARTMENT

DUTIES include the preparation of mechanical/thermal schemes for power plant and allied projects.

A knowledge of power plant operation is desirable, and a good knowledge of basic thermodynamics, hydraulics and kindred subjects is essential.

The successful candidate will be centred in London, but will be expected to undertake short visits to sites as required.

Applications giving details of training, qualifications and experience to date should be sent to the Personnel Officer, Ewbank & Partners Limited, 10/11, Grosvenor Place, London, S.W.1. 4979

SOUTHERN ELECTRICITY BOARD

Development Engineer

Newbury District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class F, Grade 6 (£935 × £20 to £995 per annum). N.J.B. conditions of service.

Applicants should be qualified to accept responsibility for handling all enquiries on tariff and supply matters, to give advice to all classes of consumer, including industrial consumers, on all aspects of tariffs, and on the most economic and efficient utilisation of electricity. Also to co-ordinate the duties of service representatives and the agricultural, refrigeration, demonstration and showroom staffs.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.949, in envelopes suitably endorsed, not later than 13th October, 1958.

Assistant Engineer (Planning)

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class E, Grade 9 (£740 × £15 to £785 per annum). N.J.B. conditions of service.

The successful candidate will be required to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should have had sound experience in electricity supply distribution and the possession of suitable technical qualifications would be an advantage. The person appointed will be required to carry out standby duties if and when called upon to do so.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.950, in envelopes suitably endorsed, not later than 13th October, 1958.

Surveyor

Southampton District of No. 4 (Bournemouth) Sub-Area. Salary N.J.C. Grade 2 (£615 × £20 to £675 per annum). N.J.C. conditions of service.

Applicants should possess a sound knowledge and experience of general survey work, with ability to peg overhead lines and prepare profiles and plans from surveyed elevations. Experience of negotiating wayleaves will be considered an advantage.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him, quoting Z.951, in envelopes suitably endorsed, not later than 13th October, 1958.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. 4991

EASTERN ELECTRICITY BOARD

Suffolk Sub-Area
102/58.N

JOINTER (E.H.T.), Stowmarket District. Applicants should have had all-round experience in jointing and connecting all classes of cable, including extra high tension.

Rate of pay at present 4s. 7½d. an hour, plus a productivity allowance of 8s. 3d. weekly (subject to service qualification), and conditions of employment in accordance with N.J.I.C. Agreement for the Electricity Supply Industry.

Apply by letter to G. N. H. Mayes, T.D., A.M.I.E.E., Manager, Stowmarket District, Eastern Electricity Board, 25, Ipswich Road, Stowmarket, Suffolk, by 13th October, 1958. 5002

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division:—

FOURTH ASSISTANT ENGINEER (Chemist), GENERATION OPERATION DEPT., DIVISIONAL HEADQUARTERS (LOCATED AT NORTH WILFORD POWER STATION) (Vacancy No. 149/58/ER).

Applicants should hold the Higher National Certificate in Chemistry and should have had previous experience of analytical work in an industrial laboratory. Previous power station experience is not essential.

The successful applicant will be required to work initially in the field of feed water treatment and air pollution, but will be expected to carry out other duties in the Divisional and station laboratories, as required.

The salary will be in accordance with Class AX/EX, Grade 8 (£710-£935 per annum) of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications, 15th October, 1958.

GENERAL ASSISTANT ENGINEER (Chemist), GENERATION OPERATION DEPT., DIVISIONAL HEADQUARTERS (LOCATED AT STAYTHORPE POWER STATION (Vacancy No. 150/58/ER).

Applicants should have had a sound technical training and some previous laboratory experience and should hold the Ordinary National Certificate in Chemistry.

The salary will be in accordance with Class AX/EX, Grade 9 (£550-£705 per annum) of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications, 15th October, 1958.

These appointments will be pensionable under the terms of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE.6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

DIVISIONAL CONTROLLER.

24th September, 1958. 4958

A.E.R.E., HARWELL

Reactor Services

A PROFESSIONAL Engineer is required to be responsible for the maintenance of several high and low-power reactors and their ancillary equipment. Appropriate mechanical, electrical and electronic experience and an engineering degree desirable.

Salary £1,300 - £1,740 (Engineer II).
Ref. 1217/48.

Engineers with at least graduateship of a senior engineering institution are required to assist in the prevention, analysis and rectification of electronic failure and to undertake training in reactor maintenance. The main requirement is an ability to establish causes from effects. A degree in light electrical engineering would be an advantage.

Salary £815 - £1,270 (Engineer III).
Ref. 1216/48.

An apprenticed or similarly trained technical officer is required to be responsible to an engineer for a team engaged in the assembly and construction of electrical control and instrumentation equipment of all types for experimental rigs and loops. Appropriate experience and National Certificate or equivalent desirable.

Salary £875 - £1,050 (Tech. II).
Ref. 1218/48.

Send POSTCARD to the Group Recruitment Officer, U.K.A.E.A., Atomic Energy Research Establishment, Harwell, Berks, for application form and details, quoting appropriate reference. 4941

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Aberthaw Power Station
(Vacancy No. 95/ER/58)

APPLICATIONS are invited for the post of POWER STATION SUPERINTENDENT at the Aberthaw Power Station, Glamorgan, which will be commissioned in the last quarter of 1959 and will have an ultimate capacity of 600 MW.

The salary will be in accordance with Class D, Grade 5 of the National Joint Managerial and Higher Executive Grades Committee (£2,100 to £2,300 per annum).

Applications stating details of engineering and management training, and experience, should be addressed to the Divisional Secretary, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Road, Gabalfa, Cardiff, so as to reach him not later than 16th October, 1958. 5000

TELECOMMUNICATION ENGINEERS

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.
LIVERPOOL, 7

have vacancies for technical staff for the Private Telephone Exchange Division.

(i) CIRCUIT ENGINEERS with experience in modern circuitry, with logical and economical approach to circuit design and development.

(ii) CIRCUIT EXPLANATORY WRITERS. Opportunities exist for promotion into Engineering groups.

(iii) COMMERCIAL ENGINEERS with experience in estimating of equipment from customers' specifications, and interpretation of traffic data. Should be capable of discussing proposals with customer or company sales organisation.

(iv) APPARATUS DESIGNERS with experience in economical production design of small electro-mechanical or similar units suitable for unit construction and easy maintenance.

The posts are on the established staff, are progressive, and have good starting salaries according to experience.

Contributory pension scheme, five-day week, and full staff amenities.

Please send details of experience, qualifications and approximate salary to—

Personnel Manager
AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.
Edge Lane, Liverpool, 7

4974

GRESHAM TRANSFORMERS LIMITED

Twickenham Road, Hanworth, Middlesex

CHIEF TRANSFORMER DESIGNER

AN experienced Transformer Engineer is required to take charge of the Design Office of this company. A wide variety of transformer types is now being manufactured, and a recently erected factory has a capacity up to about 10 MVA.

The successful applicant should have good design experience, and preferably some administrative experience.

Applications to the Chief Engineer, giving full details of career. 4951

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area, Luton District

FIRST ASSISTANT DISTRICT ENGINEER (99/58.R).

Candidates should have had a sound technical training and wide experience in the planning, construction, operation and maintenance of H.V. and L.V. underground and overhead systems including substations. Corporate Membership of the Institution of Electrical Engineers would be an advantage.

Salary N.J.B. Class H, Grade 5 (£1,160-£1,235).

Apply by letter, within 14 days, to the Manager, Luton District, Eastern Electricity Board, 487, Dunstable Road, Luton, Beds.

Northmet Sub-Area Headquarters, London, N.14

FOURTH ASSISTANT ENGINEER (System Control) (Ref. 791) (100/58.R).

Applications are invited from suitably qualified candidates to act as assistants to the Sub-Area System Control Engineers at Northmet House, Southgate, London, N.14.

Candidates should be technically qualified, experienced in construction, operation and maintenance, and have a knowledge of system protection.

Salary N.J.B. Class M, Grade 13 (£885-£930) plus London allowance, plus a shift allowance of 10% over and above the schedule salary in accordance with Clause 4 of the N.J.B. Agreement.

Apply by letter to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14, by 13th October, 1958.

Suffolk Sub-Area, Beccles District

THIRD ASSISTANT ENGINEER (101/58.R).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems (including substations) at voltages up to and including 33 kV.

Salary N.J.B. Class F, Grade 9 £790-£835).

Apply by letter, within 10 days, to J. H. Shepherd, A.M.I.E.E., Manager, Beccles District, Eastern Electricity Board, The Grove, Ingate Street, Beccles, Suffolk. 5003

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following posts :—

FOURTH ASSISTANT ENGINEERS, SYSTEM OPERATION DEPT., THAMES NORTH GRID CONTROL (Staff Vacancy No. 1070).

Salary Class AX/EX, Grade 8, £710 × £25 to £835/£935 per annum.

Applicants should have qualifications to Higher National Certificate standard and should be prepared ultimately to undertake shift duties in the Area Grid control room. Some steam generating station experience is desirable.

MAINTENANCE ENGINEER (Mechanical), BRIMSDOWN GENERATING STATION (Staff Vacancy No. 1071).

Salary Class K, Grade 6, £1,235 × £30 to £1,325 per annum plus London weighting.

Duties include maintenance of large modern turbines and auxiliary plant, with early scope for extended responsibilities.

Applicants should have served an apprenticeship and have extensive experience with high-pressure steam turbines. Supervisory and practical experience with other generating station plant, machine tools, welding, etc., and evidence of broad technical knowledge will be an advantage.

Applications, quoting the appropriate S.V. Number and Reference No. 2/9757, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts, to arrive not later than 11th October, 1958.

W. N. C. CLINCH,
Controller. 4959

WARWICKSHIRE COUNTY COUNCIL

Architect's Department

APPLICATIONS are invited for the following appointments:—

SENIOR ASSISTANT HEATING ENGINEER, A.P.T. III-IV (£845-£1,175).

Applicants should be Associate Members of the Institution of Heating and Ventilating Engineers and have had several years' experience in the design of heating, water supplies, ventilation, etc., in schools and other public buildings and running of contracts.

ASSISTANT HEATING ENGINEER (£750-£1,030).

Applicants should be Graduates of the Institution of Heating and Ventilating Engineers or hold Higher National Certificate in Electrical and Mechanical Heating and have had some years in the design of heating and water supplies.

ASSISTANT ELECTRICAL ENGINEER (£750-£1,030).

Applicants should possess the Higher National Certificate or be Graduates of the Institution of Electrical Engineers and have had several years' experience in the design of lighting and small power installations.

The appointments are on the established staff and subject to the scheme and conditions of service of the National Joint Council for Local Authorities and also the Local Government Superannuation Acts 1937-1953. The commencing salary can be within the grade according to ability and experience. The council is unable to offer housing accommodation but consideration will be given to the granting of financial assistance towards removal expenses.

Applications are to be on forms which can be obtained from G. R. Barnsley, F.R.I.B.A., County Architect, Shire Hall, Warwick.

L. EDGAR STEPHENS,
Clerk of the Council.

Shire Hall,
Warwick.
September, 1958. 4999

SOUTH OF SCOTLAND ELECTRICITY BOARD

Glasgow Area

Fourth Assistant Engineer, Planning and Development

APPLICATIONS are invited to fill the above post in the Area. Applicants should have a sound engineering training with subsequent experience in the design and layout of large distribution systems at pressures up to and including 33 kV in a densely loaded area. A knowledge of the application of modern protective equipment and of the calculation of fault levels and preparation of load flow diagrams would be an advantage.

The possession of the Higher National Certificate or equivalent qualification is desirable.

Salary scale £835/£880 per annum, Class L, Grade 13.

The conditions of employment will be in accordance with the National Joint Board Agreement for the Electricity Supply Industry. The position is superannuable.

The successful candidate will require to reside within reasonable distance of Area headquarters.

Applications on the standard form, which may be obtained from the undersigned, should be completed and returned not later than fourteen days from the appearance of this notice.

A. KELSO,
Manager.

P.O. Box 6,
75, Waterloo Street,
Glasgow, C.2.
19th September, 1958. 4960

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER (Planning) required at No. 2 Sub-Area Headquarters, Sandiway House, Northwich, Cheshire. Salary within range £790£835 per annum (N.J.B. K/13).

Applicants should have had experience of overhead and underground distribution work. Technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager at the above address. Closing date 14th October, 1958. 4977

BOROUGH OF CROSBY

Borough Engineer and Surveyor's Department

APPLICATIONS are invited for the appointment of a SENIOR ASSISTANT ENGINEER (Electrical and Mechanical) at a salary within the Special Grade, £750 per annum rising by increments of £40 to £1,030 per annum, and commencing at a point according to qualifications and experience.

The successful candidate, who should possess H.N.C. in Electrical Engineering or other approved qualifications, will be required to take responsibility for all electrical and mechanical work, including heating, ventilation, lighting and other work of a similar character. There will probably be opportunities for obtaining experience in civil and municipal engineering.

The appointment will be subject to the National Conditions of Service and the Superannuation Acts, and HOUSING ACCOMMODATION will be made available on satisfactory proof of need.

Applications, on forms obtainable from the Borough Engineer and Surveyor at the address below, must be received, suitably endorsed, not later than Wednesday, 15th October, 1958.

Canvassing, directly or indirectly, will disqualify.

HAROLD C. ROBERTS,
Town Clerk.

Town Hall,
Waterloo, Liverpool, 22. 4962

PHYSICIST

Work on Electrical Contacts

PHYSICIST OR GENERAL SCIENTIST

of graduate standard required for research and development on electrical contacts.

The work will entail study of light and medium current contacts, formation of corrosive films, metallic diffusion, microphonic noise, contact resistance, etc.

Encouragement will be given to original ideas and the appointment will enable a young graduate of one or two years' industrial experience to become a specialist to one of the largest users of electrical contacts.

The organisation is located in S.W. Lancs, and the position would be on the established staff with five-day week, including contributory pension fund, and usual amenities.

Please give full details of education and experience, and approximate salary sought, to—Box 4976.

JOSEPH LUCAS (ELECTRICAL) LIMITED

ASSISTANT ELECTRICAL DESIGN ENGINEER

required for the design of rotating electrical machines and electro-magnetic devices. Projects will include fundamental design investigations, and full scope will be given for initiative and imagination.

The post is permanent and pensionable.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Limited, Great King Street, Birmingham, 19, quoting reference PM/D/221.

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. for posts (a) and Corporate Membership for post (b) an advantage.

(b) OPERATION SUPERINTENDENT, BANKSIDE POWER STATION (Vacancy No. 58/780).

Sound technical and practical training with considerable experience in operation of large H.P. turbine and boiler plant. Will be responsible for the efficiency of plant and the control of personnel. Salary Class H, Grade 4 = £1,285 p.a.

(a) ASSISTANT ENGINEER (Mechanical Maintenance), BARKING "A/B" POWER STATION (Vacancy No. 58/781).

Applicants should have had considerable experience with the mechanical maintenance and overhaul of large turbo-alternators, P.F. and chain grate boilers and auxiliary plant. Salary Class L, Grade 9 = £1,115 p.a.

(Applicants to Vacancy No. 58/621 need not re-apply.)

(a) ASSISTANT MAINTENANCE ENGINEER (Electrical), BARKING "C" POWER STATION (Vacancy No. 58/782).

Sound technical training and wide experience of modern power station electrical plant maintenance. Character and ability to supervise staff essential. Salary Class J, Grade 8 = £1,045 p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 13th October, 1958. 4957

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts :—

South Staffs and North Worcs Sub-Area

SENIOR ASSISTANT ENGINEER (Construction) (Headquarters).

Applicants should have had a sound technical training and extensive experience in the design and construction of large distribution systems up to and including 33 kV. Experience with modern supervisory equipment is desirable. Preference will be given to candidates having appropriate qualifications, including Corporate Membership of the I.E.E. Salary £1,560/£1,665 per annum (N.J.B. Grade L.4).

Apply, within 14 days, stating age, experience, qualifications, present position and salary to Mr. H. A. P. Caddell (Ref. CW), Sub-Area Manager, Midlands Electricity Board, Toll End Road, Tipton, Staffs.

Worcester and District Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER (Redditch/Bromsgrove District).

Experience necessary in all branches of distribution work, including operation and maintenance of high and low-voltage underground and overhead distribution systems. Technical qualifications desirable. Salary £790£835 per annum (N.J.B. Grade F.9).

Apply by letter, within 14 days, stating age, experience, present position and salary to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

A. STEPHENS,
Secretary. 5001

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER, Sutton District.

Salary £685 × £15 to £730 p.a. plus London allowance under N.J.B. Class F, Grade 11. Superannuable. Applicants should possess the Higher National Certificate in Electrical Engineering and had a thorough training in underground and overhead distribution systems.

Applications, naming 2 referees, and quoting reference T.E.R. on forms from Sutton District Manager, SEEBOARD, 52, High Street, Sutton, Surrey, by 15th October, 1958.

GEORGE WRAY,
Secretary.
4990

Situations Vacant (continued)

INSPECTOR OF LIGHTS

required by SARAWAK GOVERNMENT MARINE DEPT. either on probation to pensionable establishment or on contract with gratuity of 12½% of final monthly salary for each completed month of service. Salary scale (including inducement pay) equivalent to £1,176 to £1,932 a year. Child allowance between £72 and £123 a year. Education allowance up to £280 a year. Outfit allowance £60. Free passages. Liberal leave on full salary.

Candidates, preferably under 35, should be A.M.I.E.E. or A.M.I.Mech.E. and have a good all-round knowledge of electricity, especially in connection with the operation of lighthouse flashers (Chance/Londex), Reed and Klaxon motors, echo sounding gear, straightforward small unit diesel electric generation, current conversion, etc., a knowledge and experience of small diesel engines, working knowledge V.H.F. radio equipment, and have a good head for heights up to 130 feet.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2A/50186/EF. 4975

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS invited for the following superannuable N.J.B. appointments at TIR JOHN POWER STATION, SWANSEA.

ASSISTANT MAINTENANCE ENGINEER
(Electrical)
(Vacancy No. 96/ER/58).
Salary H.9, £885-£930 per annum.

Applicants should have had wide experience in power station electrical maintenance and possess H.N.C. or equivalent qualifications.

ASSISTANT MAINTENANCE ENGINEER
(Mechanical)
(Vacancy No. 97/ER/58).
Salary H.9, £885-£930 per annum.

Applicants should have experience in the maintenance of heavy plant and possess H.N.C. or equivalent qualifications.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-Fedwen Road, Gabalfa, Cardiff, to be returned by 14th October, 1958. 5004

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable appointments:—

FOURTH ASSISTANT ENGINEERS
(Steam Plant Testing)
(Two Vacancies).
Generation/Operation Section,
Chief Engineer's Department,
Head Office, Glasgow.

Candidates should have a good technical education and have some experience of power station operation.

The duties will be to assist in carrying out tests of performance of power station plant and in non-destructive testing of materials.

Salary £710/£910 per annum in accordance with Class AX/DX, Grade 8 of Schedule B to the National Joint Board Agreement.

Apply, quoting Reference No. E38/58 on standard form AE6 available from the Secretary, P.O. Box 173, 351, Sauchiehall Street, Glasgow, C.2, not later than Saturday, 11th October, 1958. 4989

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division
Vacancy No. 94/ER/58

APPLICATIONS invited for position of SHIFT CHARGE ENGINEER, UPPER BOAT POWER STATION, PONTYPRIDD.

Salary H.7, £995 - £1,055 per annum.

H.N.C. (Mechanical or Electrical) or equivalent, and operational experience in a generating station desirable.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 8th October, 1958. 4948

CENTRAL ELECTRICITY GENERATING BOARD

North West, Merseyside and North Wales Region

VACANCY No. E25/367/R: MAINTENANCE SUPERINTENDENT, Bolton Power Station, to be responsible for the planning and supervision of all maintenance. Membership of an appropriate professional institution would be an advantage. Salary £1,065 × £25 to £1,140 p.a. (G.5).

Vacancy No. E25/365/R: ASSISTANT MAINTENANCE ENGINEER (Mechanical), Bolton Power Station. Duties will include planning and supervision of all maintenance work on mechanical plant. Salary £885 × £15 to £930 p.a. (G.8).

Applications in writing, stating age, experience and present position to Director of Labour and Welfare, Central Electricity House, 825, Wilmslow Road, Manchester, 20, by 9th October, 1958. Please quote vacancy number. 5006

JOSEPH LUCAS

(ELECTRICAL) LIMITED

Great King Street, Birmingham, 19

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

128

NORTH EASTERN ELECTRICITY BOARD

Wear Sub-Area

APPLICATIONS are invited for the appointment of FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER, Sunderland District.

Applicants should preferably have technical qualifications and experience in the utilisation of electrical energy in commercial and domestic premises, knowledge of installation work, and be conversant with tariffs, sales and all aspects of consumer service. Salary Schedule A, Class F, Grade 5, £995/£1,055 per annum, N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by the Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 4942

MIDDLESEX COUNTY COUNCIL

Education Committee

ENFIELD TECHNICAL COLLEGE, QUEENSWAY, ENFIELD, MIDDLESEX

REQUIRED as soon as possible:—
ASSISTANT LECTURER, GRADE B, to teach Electrical Engineering subjects to Ordinary National Certificate and City and Guilds standard. Candidates should be University Graduates in Engineering or possess equivalent qualification, and should have had teaching and/or industrial experience.

Burnham Technical Scale, £650 × £25 to £1,025 plus London allowance will be made for approved industrial experience.

Apply immediately (s.a.e.) to the Principal.
C. E. GURR, M.Sc., Ph.D.,
Secretary to Education Committee.
4940

CITY OF NOTTINGHAM

Assistant Engineers (Structural and Electrical) (£725 - £1,030 per annum)

APPLICATIONS are invited for the above positions in the City Engineer's Department, Nottingham, within salary range £725-£1,030, i.e., in Grades A.P.T. 2, A.P.T. 3, or Special. Grade and starting salary will depend on qualifications and experience.

Applicants should be experienced in either:—
(a) the design of steel and reinforced concrete structures, particularly building frames; or
(b) the design of electric lighting and power installations for new buildings.

Applications, on forms to be obtained from R. M. Finch, O.B.E., M.I.C.E., Guildhall, Nottingham, are to be returned to him not later than 18th October, 1958. 4949

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area

THIRD ASSISTANT ENGINEER (Distribution Design).

Applicants should have experience in the design, construction and operation of H.V. and L.V. systems and possess qualifications equivalent to the Higher National Certificate.

Graduate Membership of the Institution of Electrical Engineers is preferable.

Salary N.J.B. Class I., Grade 10, £995/£20/£1,055 per annum.

Applications, quoting 4 SAR, and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 17th October, 1958. 4992

GOVERNMENT OF GAMBIA

ELECTRICAL ENGINEER, ELECTRICITY DEPARTMENT, to take charge of the Electricity Department, which is responsible for the power house and distribution of electricity to Bathurst and Fajara and to several small plants in the Protectorate.

Contract appointment. Salary range £1,458 to £1,680 p.a. Gratuity of 25% of emoluments payable on satisfactory completion of contract. Free passages for officer and wife, and for children up to cost of two adult passages. Quarters at moderate rent. Children's allowance. Generous home leave. Free medical attention.

Candidates must be A.M.I.E.E.

Write Director of Recruitment, Colonial Office, London, S.W.1, giving briefly age, qualifications and experience, quoting BCD 145/12/01. 4939

DESIGNER-DRAUGHTSMAN

for design and development of electric wiring accessories. Good electrical training desirable and knowledge of mass production methods advantageous.

A high salary with good prospects for a senior designer with previous experience in this specialised branch of the electrical industry.

Applicants should write stating age, education, experience and salary required, and all letters will be treated in strict confidence addressed to: Ref. T.M., M.K. Electric Ltd., Wakefield Street, Edmonton, London, N.18. 4876

FREDERICK S. SNOW & PARTNERS

require

ELECTRICAL ENGINEERING ASSISTANTS

for design, specification and detailing of power distribution, electrical installations, comprising heating, lighting and power in industrial and commercial buildings.

SENIOR and INTERMEDIATE GRADES to H.N.C. standard or equivalent.

JUNIOR GRADES to O.N.C. standard with apprenticeship or equivalent training.

Write stating age, experience and salary required to—

Monro Building, Wellington Street, London, W.C.2 4950

SOUTH OF SCOTLAND ELECTRICITY BOARD

Clyde Area

SECOND ASSISTANT DISTRICT ENGINEER required for Clydebank District. Salary Scale N.J.B. Agreement, Schedule A, Class H, Grade 7, £995/£1,055 per annum. The post is superannuable.

Applicants should preferably be Graduates of the Institution of Electrical Engineers or hold equivalent qualifications, and have good experience of both H.V. and L.V. underground and overhead distribution systems.

Applications on the appropriate form should be forwarded to the undersigned within 10 days.

DANIEL ROSS,
Manager.
206, St. Vincent Street,
Glasgow, C.2.
22nd September, 1958. 4961

NORTH EASTERN ELECTRICITY BOARD

Harrogate Sub-Area

APPLICATIONS are invited for the appointment of SECOND ASSISTANT DISTRICT ENGINEER, Thirsk District, with location at Bedale.

Applicants should have had experience in the construction, operation and maintenance of H.V. and L.V. systems. Salary Schedule A, Class D, Grade 7, £790/£835. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by the Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 4987

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

ASSISTANT SHIFT CHARGE ENGINEER required at Newton Abbot Power Station.

Superannuation scheme. Salary N.J.B. Class F, Grade 9, £790 × £15 to £835 plus 10% shift allowance.

Applicants should have had sound technical training and practical operating experience in a modern power station.

Applications on form AE6/ACT obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 11th October, 1958. 4986

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a position as ASSISTANT SHIFT CHARGE ENGINEER at PORTOBELLO GENERATING STATION.

Applicants should have had experience in a modern generating station and, preferably, possess a Higher National Certificate in Electrical or Mechanical Engineering. Superannuable. Salary N.J.B. Class K, Grade 8, £1,065/£1,140 per annum, subject to an additional 10% in respect of shift duties.

Forms of application may be obtained from the Secretary, South of Scotland Electricity Board, 168, Broomhill Drive, Glasgow, W.1, and returned not later than 17th October, 1958. 4988

CLERK OF WORKS (Electrical)

required by W.D. in Arborfield. Applicants must be of British parentage and have O.N.C. in Electrical Engineering or equivalent, and five years' apprenticeship or equivalent with engineering concern.

Experience: Further three years with engineering firm or three years as supervisor of labour, chargehand or technical officer in engineering industry.

Salary according to age, qualifications and experience on range £705 (at age 28) to £820 p.a.

Apply C.R.E. North Aldershot, R.E. Office. Redvers Buller Road, Marlborough Lines. Aldershot. 4796

CLASSIFIED ADVERTISEMENTS ARE PREPAID

WOOLWICH POLYTECHNIC

London, S.E.18

APPLICATIONS invited for the position of LECTURER in Electrical Engineering from candidates with an honours degree in engineering and/or equivalent qualification. Industrial experience is desirable. The work of the department covers courses for B.Sc.(Eng.) Internal Degree of London University, the Dip.Tech.(Eng.) and Ordinary and Higher National Certificates and endorsements.

Salary scale £1,200 × £30 to £1,350 plus London allowance of £36 to £48.

Particulars and application form from Clerk to Governors, to be returned by 18th October, 1958. 4963

ADMIRALTY

DRAUGHTSMAN required for Aircraft Department, London. Must be British subject aged 21 or over with 5 years' apprenticeship or equivalent in electrical engineering, broad knowledge of aircraft electrical and instrument installations, and some drawing office experience. Experience in air electrical branch of R.N. or R.A.F. would be valuable.

5-day week. 18 days' annual leave.

Salary in range £550 (age 21) to £755 on entry, rising to £870.

Applications with full details to C.E.II (114), Empire Hotel, Bath. 4947

ELECTRICAL ENGINEERING DRAUGHTSMAN FOR STEEL WORKS

APPLICATIONS are invited for the above position to assist in the first instance in a large-scale electrical reconstruction and extension at present in progress. Permanent position, good salary and pension scheme.

Experience required in electrical plant layout and installation, control and switchgear diagrams.

Apply giving age, qualifications and experience to the Development Electrical Engineer, The Patent Shaft & Axletree Co. Ltd., P.O. Box 9, Wednesbury, Staffs. 4978

SURREY COUNTY COUNCIL

APPLICATIONS invited for appointment of ASSISTANT ELECTRICAL ENGINEER Special Grade, £750-£1,030 p.a. plus £30 p.a. London allowance. Must be A.M.I.E.E. and experienced in electrical services in buildings.

Full details, present salary and 3 copy testimonials to County Architect, County Hall, Kingston-on-Thames, as soon as possible. 4878

AN experienced technical sales representative to cover the North of England, with knowledge of low-tension control gear. Connections with shipyards and industrial users and Area Boards an advantage. Salary, commission, expenses and car would be provided.—Box 4964.

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., 24, Fennel Street, Manchester, 4. The company has a vacancy in Grimsby for an electrical surveyor. Permanent position carrying progressive salary scale £735 to £1,060 and non-contributory pension. Candidates, age 26 to 32, preferably with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply in own handwriting, stating age, qualifications and experience. 4966

BRITISH INSULATED CALLENDER'S CABLES Limited require technical assistant for development and laboratory work on thermoplastic cables. Candidates should hold or be studying for a recognised qualification in rubber and thermoplastic technology and should preferably have had some extrusion and laboratory experience. Applications should be addressed to the Secretary, W. T. Glover & Co. Ltd., Trafford Park, Manchester, 17. 4983

CHEMIST required by Enfield Cables Ltd., Brimsdown, Middx., for development and investigational work covering a wide field. Applicants should possess Higher National Certificate or equivalent level of education. Salary will be in accordance with age, experience and qualifications. Applications giving brief details, which will be treated in confidence, should be addressed to the Chief Chemist, Enfield Cables Ltd., Brimsdown, Middx. 4993

EKCO-ENSIGN ELECTRIC Ltd. require experienced lighting engineer at their Birmingham office. He should be thoroughly conversant with modern lighting practice and equipment. Apply—Senior Lighting Engineer, 45, Essex Street, Strand, London, W.C.2. 388

ELECTRIC motor and geared motor manufacturers require experienced sales engineer residing in Lancashire or Yorkshire to cover Northern Counties.—Box 4980.

ELECTRICAL contracting firm in Edinburgh of good standing has vacancies for chargehand electricians for first-class electrical installation work in conduit, pyrotenax and P.V.C. cables. Superannuation and pension scheme. Constant employment and interesting work to suitable applicants.—Box 4967.

ELECTRICAL draughtsman is required in works engineering drawing office. Duties will include design and layout of installations involving lighting, general power distribution, automatic control schemes, etc. Replies giving age, qualifications, experience and salary required to—Box 4952.

ELECTRICAL engineer required by N.C.B.'s Production Department in London. Applicants should have experience in design, manufacture and application of such light current engineering equipment so as to enable them to advise on all problems associated with intrinsically safe telephone systems, signalling systems, instruments, testing instruments, meters, electronics, etc., as used in the mining industry. Appointment (superannuable) according to qualifications and experience within inclusive range £1,350-£1,964. Write to Staff Department (X.1265.D), National Coal Board, Hobart House, London, S.W.1, for application form, which should be returned by 13th October, 1958. 4968

ELECTRICAL engineer required for design office for well-established company manufacturing electrical rotating machinery. Sound technical and good practical knowledge essential. Apply in writing to—Chief Designer, Laurence, Scott & Electromotors Ltd., Openshaw, Manchester, 11. 4953

ELECTRICAL engineer with practical test and/or outside erection experience on switchgear, control gear and generating plant. Minimum requirement Grad.I.E.E. and apprenticeship with reputable electrical manufacturing company. Excellent opportunity for able ambitious man 28/35 years old, of good presence and capable of dealing with customers' engineers. Apply—John Morris Electrical Engineering Co. Ltd., Vulcan Road, Bilston, Staffs. 4932

ELECTRICAL engineers required urgently for City engineering firm. Experience desirable in specification and contract work on power station systems. Should be members of recognised professional institution. Good salaries and prospects. 5-day week. Pension fund. Free luncheons. Write details age, qualifications and experience (I.A.M./137), Balfour, Beatty & Co. Ltd., 66, Queen Street, London, E.C.4. 4969

ELECTRICAL wholesalers (E.W.F.) have vacancy for experienced industrial representative in Lancashire. Some knowledge of electronics, and possession of own car would be advantages, but not essential. Give full details in confidence to—Box 4883.

ELECTRICAL wholesalers (E.W.F. members) require senior and junior representatives to operate from their Luton branch. Also London H.Qts. Senior applicants must have established connection with industrial users and contractors. Accounts are available to be given to suitable applicants. Own staff have been notified. Write brief particulars in strict confidence to—Box 4870.

ELECTRICAL wholesalers, London, require order clerk for customers' telephone orders. Familiar switchgear and installation materials. —Phone, Gerrard 4012 (Mr. Welfare). 5005

ELECTRICIAN, West Africa. A company with wide electrical sales and contracting interests in West Africa require a skilled electrician for service there. Applicants must have full training and experience in installation work, tungsten and fluorescent lighting, installation and servicing of small electrical generating sets and must be fully capable of compiling and submitting estimates and supervising the work. Some experience of handling native labour will be an advantage. Only men, preferably under 40, with the fullest experience should apply. Full details of salary, conditions and privileges will be given to those selected for interview.—Box 4871.

Situations Vacant (continued)

ELECTRICIAN required for factory and commercial installations. Apply—Priory Electric Service (Cov.) Ltd., 3, Lower Ford Street, Coventry. 4994

ESTIMATING engineer required for London office of electrical contractors, experienced from negotiation to final account.—Box 4995.

EXPANDING electrical wholesaler requires live branch manager for S.E. London. Previous experience essential. Scope for advancement. Salary, commission, pension scheme. —Box 4981.

FIRST-class senior electrical engineer required to take charge of the office of a consultant in the Victoria area. Age not below 30. Must have had extensive experience in consulting engineering and be capable of accepting design responsibility for large internal lighting and power installations, mains distribution systems and substations. Salary up to £1,600 according to qualification and experience. Reply in confidence to—A. F. Myers & Partners, 147, Victoria Street, London, S.W.1. 4826

JUNIOR draughtsman required for varied work on small and large power transformers, design of control cubicles and special application devices. The position is of considerable scope for person with initiative. Apply giving details of past experience, age and salary required to Personnel Officer, Foster Transformers Limited, London, S.W.19. 4943

LIFT engineer required by consulting engineers for detailed design, preparation of specifications and carrying out tests. Five-day week, spring and summer holidays, luncheon vouchers. Please reply giving details of age, experience and salary required to—J. Stinton Jones & Partners, 21, Gloucester Place, London, W.1. 4827

LIGHTING sales representatives required for London area. Only salesmen experienced in selling fittings, gear and lamps to industrial and commercial users with proved sales records may apply. Salary and commission. Car provided or contribution made to car owners. Apply to—Secretary, Ensel Electric Co. Ltd., 3, Eden Grove, Holloway Road, London, N.7 (Telephone No. NORth 5866). 4933

OVERHEAD line engineer required for consulting engineers' office in Scotland. Dual experience steel tower lines up to 132 kV and wood pole construction up to 33 kV desirable. Applicants please send outline of technical training and overhead line experience to—Kennedy & Donkin, 3, North Charlotte Street, Edinburgh, 2. 4982

QUALIFIED electrical engineer required by company of international importance operating a large group of manufacturing centres in the United Kingdom. Applicants must have five years' practical experience in industry and be fully conversant with all types of motor switchgear and distribution equipment. Knowledge of automatic process control panels and instruments for temperature, pressure and humidity regulation an asset. Position based on London headquarters with excellent working conditions and pension scheme. Candidates should be between the age of 25-35. Applications in long hand, accompanied by a recent passport photograph, to Chief Engineer, Ref. N.A.2, Saward Baker & Co. Ltd., 27, Chancery Lane, London, W.C.1. 4872

SALES engineer for control signalling and allied types of cable to nationalised industries, consultants and contractors. Salary, expenses and bonus. Write fullest details, qualifications, positions held to—Box 9492.

SALES engineers required as technical representatives for London, Manchester and Glasgow. Applicants should preferably be engaged on motor control gear sales, but full consideration will be given to men with sales office or general experience on control gear. Good basic salary, sound incentive bonus, reasonable allowances and a non-contributory pension and life assurance scheme after qualifying period are offered. Full details of age, experience and present position in own handwriting to—M.T.E. Control Gear Ltd., Leigh-on-Sea, Essex. 4970

SALES representative with connection among electrical contractors North, North-West, East London required. Salary £750, commission, usually exceeding salary, good expenses. Full details—Box 9491.

SENIOR design development engineer required by well-known manufacturer of rotating electrical machines. A vacancy with opportunity for a man with ability and experience in design of medium-sized induction motors. Submit experience, salary, age, etc.—Box 394.

SUPERVISING engineer required by electrical contractors in N.W. London area. Please give age, details of experience and salary required.—Box 4903.

SURVEYOR for overhead transmission lines in Edinburgh area. Apply—Miller & Stables Ltd., 15, Duncan Street, Edinburgh, 9. 4996

TECHNICAL assistant required in the publicity department of The English Electric Company, Stafford, to assist in the editing, layout and production of operating and instruction manuals for heavy electrical plant and associated equipment. Previous experience in this class of work desirable. Please apply giving details of age, experience and salary expected to the Assistant Publicity Manager, The English Electric Company Limited, Foregate Street, Stafford. 4971

THE TELEGRAPH CONSTRUCTION & MAINTENANCE Co. Ltd. require a salesman having experience and successful connections with users of paper and plastic cables. Applicants should have enthusiasm and drive, and an attractive salary, car and good prospects are offered. The area of operation will be North London—East Anglia. Applications should be sent to the Home Sales Manager, T.C.M. Co. Ltd., Mercury House, Theobalds Road, London, W.C.1. 4972

THE TELEGRAPH CONSTRUCTION & MAINTENANCE Co. Ltd. require a technical sales representative in the Midlands area for all types of cables and accessories. Applicants should preferably have experience and successful connections with users of paper and plastic cables, and would be based at Dudley. Applications giving details of qualifications and experience should be sent to the Home Sales Manager, T.C.M. Co. Ltd., Mercury House, Theobald's Rd., London, W.C.1. 5007

VACANCIES for senior and junior sales engineers exist at a progressive manufacturer of transformers and kindred equipment in the Greater London area. Permanent employment with good salary and pension rights available to men of good appearance, connections and experience. Please apply—Box 4904.

WANTED, an estimating and supervising engineer. Applicants apply in writing, stating full details of experience, age and salary required.—Brand Electrical & Engineering Co. Ltd., Kingsway House, 17/18, Dock Street, Newport, Mon. 4954

WASHING advisers required for interesting and varied career in all parts of the country. The positions are pensionable and carry a good salary, bonus and travelling expenses. Applicants should be between the ages of 23 and 35, of good appearance and capable of working on their own initiative. Domestic science preferred but not essential as full training will be given. Write immediately giving complete details of previous training and experience to—Chief Washing Adviser, Hoover Limited, Perivale, Greenford, Middx. 4997

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

ELECTRICAL engineer, 27 years, public school education and H.N.C., seeks responsible administrative post, London area. 4 years' practical experience and 5 years' sales administration.—Box 9495.

EXPERIENCED representative covering Electricity Board, wholesalers, etc., South-West England, offers services to established manufacturer, sole or agency basis. Resident Bristol.—Box 9488.

REPRESENTATIVE (31) seeks position with wholesaler. West London area. Sound knowledge of trade, with storekeeping and installation experience. Only live organisations need reply.—Box 9485.

QUALIFIED electrical engineer, excellent Midlands connection, seeks technical representation on a retainer basis with a company of national repute.—Box 9489.

SALES engineer, A.C.T.(B'ham), A.M.I.E.E., requires appointment in B'ham or Bristol. Apprenticeship 300-MW power station followed by 12 years' outside selling experience handling H.V./L.V. switchgear, transformers and power factor correction capacitors.—Box 9482.

ARTICLES FOR SALE

T.W.W.

Large A.C. Motors
3-phase, 50 cycles

Maker	H.P.	Volts	R.P.M.
B.T.H.	1820	3.3 kV	368
B.T.H.	1800	400/440	368
MATHER & P.	350	400/440	720
METRO-VICK.	310	400/440	1440
MATHER & P.	300	400/440	720
BRUSH	250	400/440	420
B.T.H.	250	400/440	480
MATHER & P.	200	400/440	960
BROOK	110	400/440	580

THOS. W. WARD LIMITED
Albion Works, Sheffield
(Phone 26311, ex. 347; Grams, "Forward") 321

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.
ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

HOUSE SERVICE METERS

200 240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.
UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd., London W.4. 57

A BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675 kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-588 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (EALing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists. — Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS and motor-alternators, 24, 110 and 220 v. D.C. to 230/1/50 A.C., 300 watts to 6 kVA in stock.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

D.C. to A.C. converting plant. One set 375-kVA capacity, input 500/550 volts D.C., output 440/3/50 cycles, 4-wire, with switchgear. Two ditto sets, each 125-kVA capacity. Two sets, each 75-kVA capacity, input 220 volts D.C., output 400/3/50 cycles, 4-wire, with switchgear.—Box 4864.

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

FANS. 8 G.E.C. "Kingsway" 56-inch, 3-blade, A.C. ceiling fans (used), 230 volts, complete with canopies and speed regulators at £10 each. 200 G.E.C. 12" A.C. fans for table or wall mounting, 110 volts. Boxed and packed. Price on application.—M. Boyask & Son, 65, Sidney St., London, E.1 (Bis. 3710). 4998

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues.—The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FOR sale, motor generator, rotary converter and Ward Leonard sets in a great range of outputs, speeds and control systems.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 161

FREQUENCY changers and variable frequency M/A sets in stock, and to specification.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 148

GENERATING plants of all types, new and reconditioned up to 100 kVA in stock. Special plants built to order at short notice; automatic mains failure, etc.—Powerco Ltd., 312, York Rd., London S.W.18 (VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW, A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 163

HIGH frequency alternators and converters, 400 to 2,600 cycles up to 6 kVA in stock. Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 149

MOTOR generator set with work motor forming a Ward Leonard type control for variable speed drive. Set with A.C. motor and starter for 400 volts, 3-phase, 50 cycles, coupled to D.C. generator, 0/400 volts, with exciter and controls; work motor 0/120 h.p., 0/700 r.p.m. Further details from—Dynamo & Motor Repairs Ltd., Wembley Park Works, North End Road, Wembley, Middlesex. 4944

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock. — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTOR generators of all types in stock and to specification up to approx. 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 152

MOTORS and control gear, huge stocks all types, ½ to 200 h.p.—Ramsbottom & Co. Ltd., Elec. Engineers, Keighley (3774/5/6). 70

NAMEPLATES, engraving, diesinking, stencils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading. — Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. and D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject. — F. F. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converters in stock, all sizes; enquiries invited. — Universal Electrical, 221, City Road, London, E.C.1. 34

SECONDHAND electrical plant can be as good as new if you buy it from specialists. Write for our stock list.— Dynamo & Motor Repairs Ltd., North End Road, Wembley Park, Middlesex (Telephone, Wembley 3121); Soho Road, Handsworth, Birmingham (Telephone, Birmingham Northern 0898). 73

SLYDLOK fuses for sale.—Ryness Supplies, 37, Goodge Street, London, W.1. 284

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters and time switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generating sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd.. Britannia Walk, London, N.1. 27

500 lb. of Henry Wiggins high flex, 45 (Phermo metal strip, 3½" wide) (.008 and .010). Reasonable offer considered.—Box 9493.

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service. — Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return. — Whitetrade Limited, Rochester, Kent (Tel. Chatham 41133, 3 lines). 294

ARTICLES WANTED

HARRINGTON & Sons, reclamation contractors, want redundant A.C./D.C. electric motors and transformers, stocks of cable, etc.—109, Beaconsfield Street, New Beckton, East Ham. London, E.6 (ALB. 1388). 315

MERCURY (Quicksilver) wanted. Write for packing instructions. Gold, silver and platinum also purchased.—Collingridge & Co. Ltd., Riverside Works, Riverside Rd., Watford (Tel. 5963). 114

QUICKSILVER & beryllium copper urgently required for best prices and prompt cash.—Sterling Products Ltd. (Ealing 9248). 293

SURPLUS laminations, enamel copper wire, screws, nuts, flex. Good prices paid. Full details to—Box 199.

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 13

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

WANTED, rotary converters, any sizes.—Universal, 221 City Rd., London E.C.1. 35

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

WORK WANTED AND OFFERED

A.C. and D.C. motor rewinds and repairs. Prompt service, fully guaranteed.—Edgware 5566/9; Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 92

SMALL armature, stator, transformer and general coil winding undertaken on production run.—Kensal Electrics Ltd., 151, Kensal Rd., London, W.10 (LAD. 4530). 202

AGENCIES

SALES AGENTS REQUIRED

BY ELECTRIC LAMP AND INDUSTRIAL FITTINGS MANUFACTURERS. Areas available in the Midlands, Home Counties, Yorkshire, Lancashire and Scotland. Applicants must have first-class connections with industry and electrical trade. Only well-established firms or individuals considered. For full details write—Box 4839.

A WELL-established Midlands agent, qualified electrical engineer, seeks additional technical representation on retainer and/or commission basis.—Box 9490.

AGENTS now calling on Electricity Boards in Midland, South Eastern and Southern area required to take over existing territory for manufacturers of thermostats. Must have first-class connections.—Box 396.

FREE lance agent requires further lines Herts. and West Essex. Reputable firms only. Some servicing possible.—Box 9496.

WELL-established refrigeration service company operating in London and Greater London with modern equipment and excellent administrative facilities would like to represent refrigerator manufacturers or agents, either British or foreign, with a view to "selling" and "after sales service." Strict confidence.—Box 4955.

BUSINESS OPPORTUNITIES

ARMATURE winding. Small manufacturer of specialised F.H.P. motors requires additional capacity. Would consider acquiring interest in or other arrangement with winding shop having facilities for up to 50 per week.—Box 9494.

EDUCATIONAL

CITY AND GUILDS OF LONDON INSTITUTE
(Incorporated by Royal Charter)

INSIGNIA AWARD IN TECHNOLOGY

THIS Award is open to those who have gained an appropriate Full Technological Certificate of the Institute or a suitable equivalent and have, by further study, broadened their knowledge of the problems of their industry and have extended their understanding of the scientific principles upon which it is based.

Candidates must be at least thirty years of age and have had a minimum of seven years' suitable progressive and responsible experience. They are required to write a critical report or thesis upon a subject connected with their industry and to appear before an interviewing panel of the Institute. Under the terms of the Institute's Royal Charter successful candidates are entitled to use the designatory letters C.G.I.A.

Further particulars may be obtained from the Secretary, Insignia Award Committee, Gresham College, Basinghall Street, London, E.C.2. 4945

CITY & Guilds (Electrical, etc.) on "No Pass —No Fee" terms. Over 95% successes. For full details of modern courses in all branches of Electrical Technology send for our 144-page handbook. Free and post free.—B.I.E.T. (Dept. 12A), 29, Wright's Lane, London, W.8. 100

COMPANY MEETINGS

A. C. COSSOR

Competition in Domestic Radio and Television

THE 20th Annual General Meeting of A. C. Cossor Limited was held on 26th September in London, The Most Hon. The Marquess of Exeter, K.C.M.G., LL.D. (the Chairman) presiding.

In his circulated address the Chairman said: The hopes which we had of a successful year, even up to the time when I last addressed you, have suffered a considerable disappointment. The loss for the year resulted almost entirely from a severe setback in our business from Radio and Television. Had it not been for this, the profits on our other operations, if they had stood by themselves, would, I think, have seemed not unsatisfactory.

Cossor Radar & Electronics, now the largest of our subsidiaries, had a successful and profitable year, and is going forward actively and confidently. **Sterling Cable Company** maintained its fine record of increased business and good profits; **Cossor Instruments** continued to make steady progress, and normal profits; **Cossor (Canada)** had a good year, with increased profits and a considerably strengthened position; the new **Communications Company**, though still in the development stage, continued to establish itself; **Best Products** was reorganised under its new management, and made progress in recovering from its previous setback. Only the **Radio & Television Company** met with serious trouble and sustained a substantial loss, and this also, to a minor degree, affected **Lea Bridge Cabinet Works**, the profits of which were consequently less than we had expected.

The Chairman then outlined certain general factors which had affected all their operations alike, and continued:—

The Group turnover at £7.6 million was only slightly less than the previous year (£7.7 million). The Export turnover amounted to £1.6 million. The Group trading profit, however, fell to £294,106, as compared with £444,116, and increased expenses, particularly interest, resulted in a Group loss, before taxation, of £44,376 (as against a Group profit last year of £175,252).

After reviewing in detail the trading activities and prospects of the various divisions, the Chairman concluded: Although there are some bright and promising sides to our business, I do not think that the current year can be very good. The steps taken to restore the Radio and Television position will take some months to bear fruit, and the market has not been helped by the reduction in the Budget of purchase tax on competitive goods. The Radar & Electronics Company, encouraging though its prospects are, will incur extra expense, and probably some slowing of production, during the process of moving its factory to Harlow New Town. These measures will undoubtedly strengthen us, and yield results later on, but the present year must be one of ploughing rather than harvesting.

The report was adopted. 4984

STEELS
IN MODERN INDUSTRY

A Comprehensive Survey by 29 Specialist Contributors

General Editor, W. E. Benbow, late Editor of IRON & STEEL. Specifies the steels best used in various engineering applications (bearing in mind the present need for economy), describes their general and special properties, and how they may be surface finished for anti-corrosive and other purposes. This work comprises 562 pages with 260 illustrations, and has a foreword by Dr. H. J. Gough, C.B., M.B.E., M.I.MECH.E., F.R.S.

42s. net. By post 43s. 9d.

Obtainable from all booksellers or direct by post from Iliffe & Sons Ltd. at the address below.

DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1

INDUSTRIAL BRAZING

The first full-length study of this subject.
By H. R. Brooker and E. V. Beatson, B.Sc.(Eng.), A.M.I.E.E.

Industrial brazing as a process for metal fabrication has advanced to such an extent that those engaged in the work have found difficulty in keeping pace with its many developments. This book, written by two leading authorities, covers all modern brazing methods including torch, furnace, high-frequency induction, resistance, salt bath and dip, with chapters on the special techniques necessary for aluminium, stainless steels, beryllium copper, cemented carbides and vacuum tube construction.

35s. net. By post 36s. 6d.

Obtainable from all booksellers or direct by post from the address below

Iliffe & Son. Ltd., Dorset House, Stamford Street, London, S.E.1

Essential to all in the electrical industry

ELECTRICAL
WHO'S WHO 1958 - 59

When the first edition of ELECTRICAL WHO'S WHO appeared in 1950 it was hailed as a reference book which met a long-standing need.

The fifth edition of this comprehensive personal directory contains some 8,000 biographies of people in all branches of the industry, showing education, training, careers to date, membership of associations and private addresses, with an additional alphabetical listing of firms and organizations in the industry, with their principals.

The 1958-59 ELECTRICAL WHO'S WHO should be on YOUR desk.

27s 6d net BY POST 29s 3d

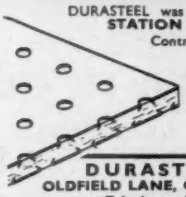
NOW READY

from leading booksellers

Electrical Review Publications Ltd. Dorset House Stamford Street London S.E.1

STRUCTURAL FIRE PROTECTION *with* DURASTEEL *3DF2 Composite* Steel-&-Asbestos Sheets . . .

- *PARTITIONS*
- *FIRE RESISTING DOORS*
- *LIFT SHAFT ENCLOSURES*



DURASTEEL was specified at **FERRYBRIDGE "B" POWER STATION** for insulation of machinery mountings.
Contractors: C. A. Parsons & Co. Ltd.

DURASTEEL is used for VITAL PLANT PROTECTION by CENTRAL ELECTRICITY GENERATING BOARD, G.P.O., BRITISH RAILWAYS, etc., etc.

Send for data to Durasteel:

DURASTEEL LIMITED
OLDFIELD LANE, GREENFORD, MIDDLESEX
Telephone: WAXlow 1051 P.B.X.

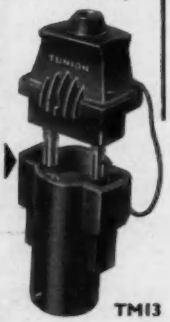
TRADE TUNION MARK

CONNECTORS and ADAPTORS

TM188

An excellent range of the above Tunion products are available to meet various requirements.

TM188. This connector is for attaching live flexible lead to appliances requiring an earth connection. It consists of recessed and flanged 3-pin plug base for fixing permanently to appliance and a well shrouded and recessed socket fitting for terminating flex particularly suitable for fluorescent fittings. Both portions are effectively inter-keyed to prevent insertion in wrong position.



TM13

TM13. This adaptor is absolutely safe. Live sockets are so well shrouded that it is impossible either to make accidental finger contact or to insert one pin and leave the other pin, which may be alive, exposed.

Further types of adaptors and connectors are shown on pages 22 and 25 of our 34 page illustrated Brochure 1453/ER which also gives details of over 400 Tunion products. A copy will be sent you on request.

GEORGE TURNOCK LTD.
Tunion Works, Navigation Street, WALSALL, Staffs
Telephone: Walsall 4966

For Every Gauge IN EVERY WIRING INSTALLATION

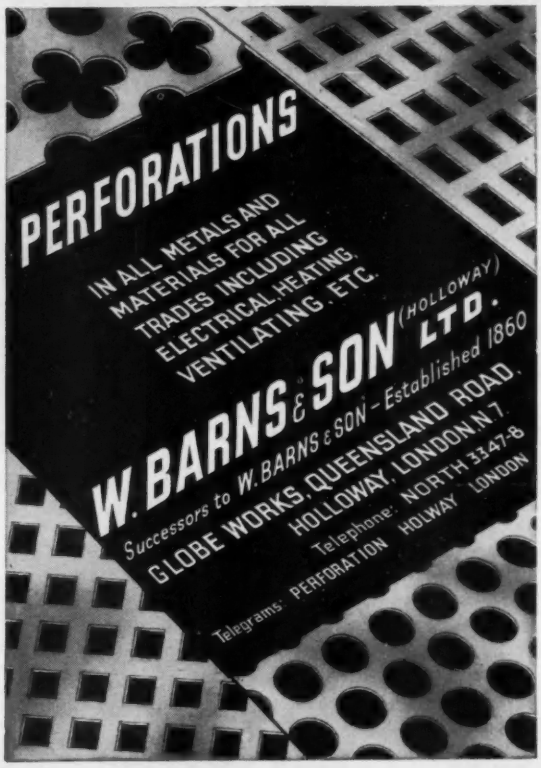
PORCELAIN IS BETTER, EASIER SAFER AND MORE PERMANENT THAN ANY OTHER CONNECTOR FOR EVERY GAUGE WIRING

SCRUIT
REGISTERED TRADE MARK

BRITISH MADE, ONE PIECE PORCELAIN CONNECTORS

MADE BY V.G. PORCELAIN CO. LTD.
GORST RD., PARK ROYAL, LONDON, N.W.10. *Telephone:* ELGAR 7362

Distributors: S. O. Bowker Ltd., Gee (Birmingham) Ltd., Birmingham, and Metway Ltd., Brighton


PERFORATIONS
IN ALL METALS AND MATERIALS FOR ALL TRADES INCLUDING ELECTRICAL, HEATING, VENTILATING, ETC.
W. BARNS & SON (HOLLOWAY) LTD.
Successors to W. BARNS & SON - Established 1860
GLOBE WORKS, QUEENSLAND ROAD, HOLLOWAY, LONDON, N.7.
Telephone: NORTH 3347-8
Telegrams: PERFORATION HOLWAY LONDON

CONTACTS

for maintenance or production

A DOZEN OR A MILLION

A.I.D. Approved

Contacts for every electrical purpose in any metal. Switch and Control Gear spares for every type of British or Foreign Gear. Any Quantity. We supply hundreds of maintenance electrical engineers and switchgear manufacturers throughout the world.

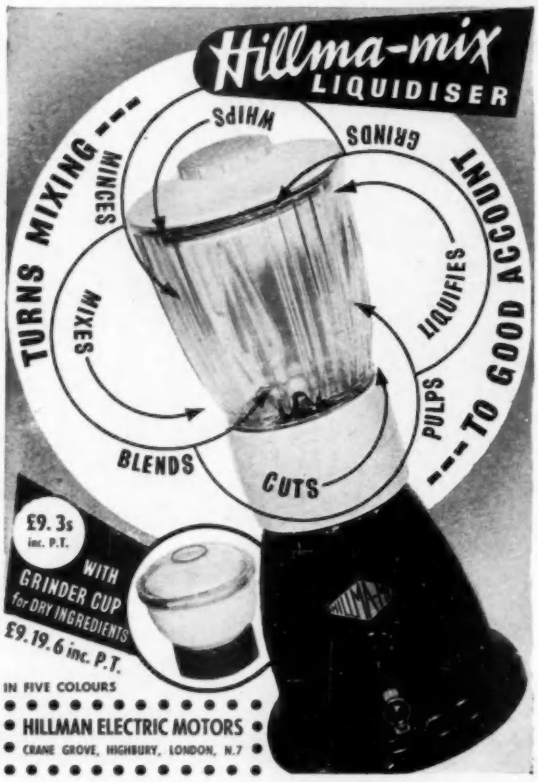
PAXTONS (ELECTRICAL) LTD.
WESTON – SUPER – MARE
Telephone: 1357

Another **ALUMINIUM REFLECTOR** *in the* **STOCKFIELD** *range*

★ *Our SP/1 Reflector spinning in super purity aluminium, electro-brightened and anodised to give very high reflectivity.*

Spinners to the Trade

STOCKFIELD MFG. CO. LTD.
23 Stockfield Road
BIRMINGHAM 27
Telephone: Acocks Green 2931



INSULATED WIRES AND STRIPS

REGD

STANDS FOR THE BEST

F. D. SIMS LIMITED
P.O. BOX 8, Hazelhurst Works
RAMSBOTTOM - Manchester
Telephone: Ramsbottom 2213/4/5
Telegrams: "SIMS" Ramsbottom
London Office and Stores:
106 Newlands Park, Sydenham, London, S.E.26
Telephone: SYDenham 4211/2

549

New Landmarks

IN BOILER DESIGN

240,000 lb/hour at 3,300 p.s.i. and 1,060°F

860,000 lb/hour at 1,600 p.s.i. and 1,010°F

Simon-Carves Ltd have broken new ground with two recent orders for boiler plant.
At Margam, for the Steel Company of Wales, they are building a once-through forced circulation boiler to generate 240,000 lb of steam per hour at 3,300 p.s.i. and 1,060°F with re-heat to 840°F.
This is the first Benson-type boiler to be built in Britain and the steam conditions are the most advanced ever commercially used in this country.
At the Padiham 'B' power station of the Central Electricity Generating Board, Simon-Carves are to build a 120-MW reheat boiler unit of the continuous-slagging type. This unit, which will generate 860,000 lb per hour of steam at 1,600 p.s.i. and 1,010°F, with reheat of 785,000 lb per hour to 1,005°F, will be one of the first, if not actually the first, of this type to be built in this country.
It will convert the whole of the ash and the dust into slag and thereby both avert the nuisance of handling and disposing of fine ash and produce a usable product.
At the same time, Simon-Carves are busy at home and abroad on the design and construction of conventional boiler plant—a speciality in which they have long played a leading part.

Complete power plant
by Simon-Carves Ltd

SIMON ENGINEERING GROUP

STOCKPORT, ENGLAND

OVERSEAS COMPANIES | *Simon-Carves (Africa) (Pty) Ltd: Johannesburg* *Simon-Carves (Australia) Pty Ltd: Botany, N.S.W.*

SC181

Abbotflex Ltd. 56
Airscrew Co. & Jicwood Ltd. 98
Allen West & Co. Ltd. 23
Anders Electronics Ltd. 16
Anglo-American Vulcanized Fibre Co. Ltd. 41
Arcolectric Switches Ltd. 52
Armorduct Cable Co. Ltd. 122
Atlas Lighting Ltd. 35
Atlas Steel Foundry & Eng. Co. Ltd. 52

Banner Electric Co. Ltd. 120
Barns, W., & Son (Holloway) Ltd. 117
Baume & Co. Ltd. 50
Bill Switchgear Ltd. 3
Birch, H. A., & Co. Ltd. 82
Braby, F., & Co. Ltd. 94
Bray, E. N., Ltd. 87
Brentford Transformers Ltd. 50
British Klockner Switchgear Ltd... 77
British Thomson-Houston Co. Ltd. 5
Brookhirst Switchgear Ltd. 34
Brotherhood, Peter, Ltd. 30
Brown, N. C., Ltd. 22
Bryce Electric Construction Co. Ltd. 4
Bull, John, Rubber Co. Ltd. 91
Bulpitt & Sons Ltd. ..... Cover 4
Burt, Boulton & Haywood Ltd. 91
Bushing Co. Ltd. 101

Cable Makers Association 40
Caird (Dundee) Ltd. 76
Carter Gears Ltd. 97
Chamberlain & Hookham Ltd. 14
Chloride Batteries Ltd. 15
Clarke, H., & Co. (Manchester) Ltd. 64
Colne Switchgear (K & W) Ltd. 103
Contractors, Electrical, Regional Guide to ..... 105 & 106
Cossor, A. C., Ltd. (Company Mtg.) 116
Coughtrie, J. & G., Ltd. 99
Cox-Walkers Ltd. 80
Crabtree, J. A., & Co. Ltd. 10
Cressall Mfg. Co. Ltd. 54
Critchley Bros. Ltd. 30
Crofts (Engineers) Ltd. ..... 44 & 45
Cryselco Ltd. 95
Curtis Mfg. Co. Ltd. 122

Dacier Ltd. 86
Daly (Condensers) Ltd. 74
Denis Ferranti Co. Ltd. ..... Cover 3
Drummond, John (Engineers) Ltd. 100
Dubilier Condenser Co. (1925) Ltd... 71
Durasteel Ltd. 117

E.M.B. Co. Ltd. 90
E.M.P. Electric Ltd. 37
Ekco-Ensign Electric Ltd. ... 24, 25 & 27
Electric Depôt Ltd 22
Electric Elements Co. 80
Electrical Who's Who 116
Ellison, Geo., Ltd. 57
Enfield Cables Ltd. 2
Engel & Gibbs Ltd. 49
English Electric Co. Ltd. ..... 72, 88 & 89
Erskine, Heap & Co. Ltd. 9
Evans, F. W., Ltd. 47
Everett Edgcumbe & Co. Ltd. 68
Excelall Metal Workers Ltd. 34

Ferguson Pailin Ltd. 6
Ferranti Ltd. 43
Fibreglass Ltd. 92
Field & Grant Ltd. 38
Fitter & Poulton Ltd. 82
Frost, N. T., Ltd. 80

Gaskell & Grocott Ltd. 120
Geipel, W., Ltd. 16
General Electric Co. Ltd. ... 19, 65 & 108
Godwin, H. J., Ltd. 22
Greenwood Airvac Conduits Ltd. ... 81
Guide to Electrical Contractors, Regional ..... 105 & 106

Hackbridge & Hewittic Electric Co. Ltd. 75
Harvey, G. A., & Co. (London) Ltd. 21
Hawke Cable Glands Ltd. 56
Heatrae Ltd. 1
Heaven, Dowsett & Co. Ltd. 98
Hendrey Relays Ltd. 47
Henley's, W. T., Telegraph Works Co. Ltd. ..... Cover 1
Heys, Leonard, Ltd. 106
Hillman Electric Motors 118

Insuloid Mfg. Co. Ltd. 62

J.B. Electric Ltd. 100

Key Engineering Co. Ltd. 8
Klockner-Moeller England Ltd. 78

L.P.S. Electrical Co. Ltd. 98
Lamb Hingley & Co. Ltd. 21
Langley London Ltd. 17
Litholite Insulators & St. Albans Mouldings Ltd. 103
Liverpool Electric Cable Co. Ltd.... 104
Logan, W., & Co. Ltd. 59
Longbottom & Co. (Keighley) Ltd. 47

Martindale Electric Co. Ltd. 71
Matthews & Yates Ltd. 29
Mersey Cable Works Ltd. 31
Metropolitan-Vickers Electrical Co. Ltd. ..... 20 & 70
Metway Electrical Industries Ltd. ..... 22, 56 & 120
Micanite & Insulators Co. Ltd. 83
Midland Dynamo Co. Ltd. 66
Midland Electric Mfg. Co. Ltd. Cover 2
Monmore Conduits Ltd. 103
Morris, John, Electrical Engrg. Co. Ltd. 34

Neco Geared Motors Ltd. 42
Neo Electrical Industries Ltd. 123
Nettlefold & Moser Ltd. 66
New Switchgear Construction Co. Ltd. 74
Newton Bros. (Derby) Ltd. 12

Ormond Eng. Co. Ltd. 26
Otter Controls Ltd. 42

Paxtons (Electrical) Ltd. 118
Pearce, A. (Birmingham) Ltd. 34
Permali Ltd. 58
Philips Electrical Ltd. ..... 100 & 102
Plastic Insulated Cables Ltd. 12
Plasticable Ltd. 56
Pope's Electric Lamp Co. Ltd. 36

Quicksilver Tube Mfg. Co. 120

Reyrolle, A., & Co. Ltd. 55
Rheostatic Co. Ltd. 85
Rich & Pattison (B'ham) Ltd. 60
Richardsons Westgarth (Hartlepool) Ltd. 11
Rix, G. A. 97
Robinson, D., & Co. 100
Robinson, L., & Co. Ltd. 82
Rolco Engineering Ltd. 56
Rowlands Electrical Accessories Ltd. 7

Sanders, W., & Co. (Wednesbury) Ltd. 46
Savage Transformers Ltd. 61
Scholes, Geo. H., & Co. Ltd. 13
Shimwell Alexander & Co. Ltd. 21
Siemens Edison Swan Ltd. 96
Simon-Carves Ltd. 119
Simplex Electric Co. Ltd. ..... 48 & 93
Sims, F. D., Ltd. 118
Skefko Ball Bearing Co. Ltd. 18
Smith & Davis Ltd. 59
Smiths Industrial Instruments Ltd. 63
South Wales Switchgear Ltd. 84
Sperryn & Co. Ltd. 38
Standard Telephones & Cables Ltd. 79
Statter, J. G., & Co. Ltd. 39
Stewart Transformers Ltd. 97
Stockfield Mfg. Co. Ltd. 118
Sun Electrical Co. Ltd. 53
Sunvic Controls Ltd. 54
Sutherland, A. G., Ltd. 16

Telegraph Construction & Maintenance Co. Ltd. 51
Transformer & Electrical Co. Ltd. ... 80
Turnock, Geo., Ltd. 117

Universal Electrical Co. 122
Utilities (London) Ltd. 64

V.G. Porcelain Co. Ltd. 117
Vent-Axia Ltd. 69
Volex Electrical Products Ltd. 107

Wades (Halifax) Ltd. 60
Wandleside Cable Works Ltd. 28
West Insulating Co. Ltd. 16
Westinghouse Brake & Signal Co. Ltd. 121
Wiggin, Henry, & Co. Ltd. 73
Winter Trading Co. Ltd. ..... 32 & 33
Wootton & Co. Ltd. 29

Advertisement copy and blocks for printing in black and white should reach us 16 days preceding date of issue addressed to Electrical Review, Dorset House, Stamford Street, London, S.E.1

BANNER COIL COMPARATOR

Compares batches of similar Coils with standard coil.

Detects 1% error in number of turns.

THE BANNER ELECTRIC CO. LTD.

HODDESDON, HERTS. *Tel. Hodd 2659*

MAKERS OF GOOD TRANSFORMERS

METWAY *means* **ELEMENTS**

BETTER STOCK UP NOW AND BE SURE TO SPECIFY METWAY!

If you would like a copy of our 56 page catalogue— ASK FOR CAT. No. MYP/3ER

METWAY WORKS KEMPTOWN BRIGHTON

MERCURY SWITCHES

will solve your switching problems
We offer completely reliable switches coupled with good delivery

Write for catalogue

QUICKSILVER TUBE MFG. COMPANY

Willow Road, Poyle Estate, Colnbrook, Bucks.

Tel.: Colnbrook 2382

GASKELL & GROCOTT *Ltd*

Est. 1874

Patentees and Manufacturers of

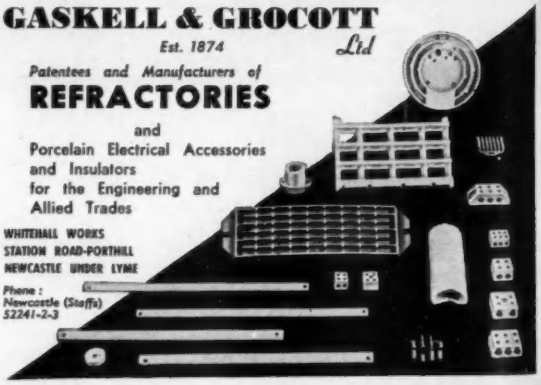
REFRACTORIES

and

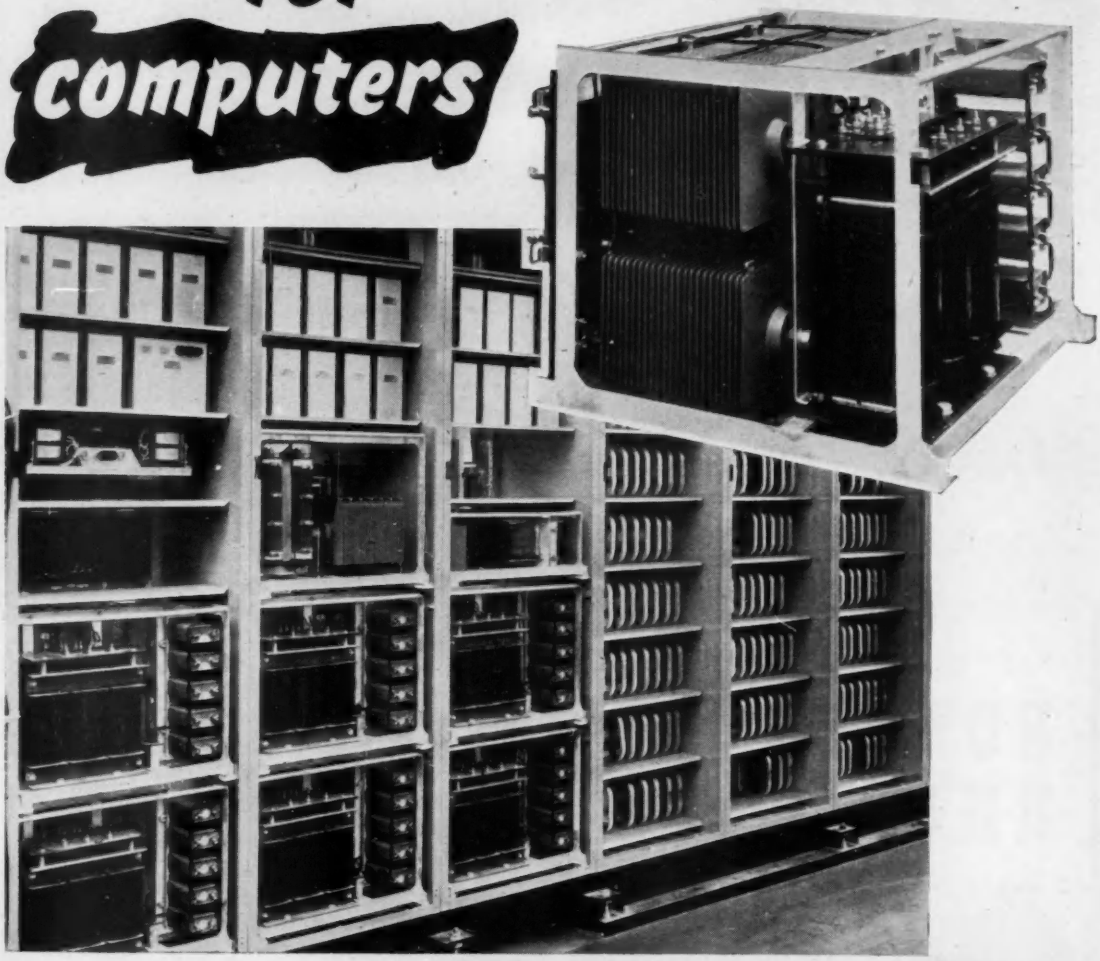
Porcelain Electrical Accessories and Insulators for the Engineering and Allied Trades

WHITEHALL WORKS
STATION ROAD-PORTHILL
NEWCASTLE UNDER LYME

Phone: Newcastle (Staffs) 52241-2-3



D.C. Power Supplies for computers



WESTINGHOUSE

RECTIFIERS

are incorporated in the electronic computers manufactured by Elliott Brothers (London) Ltd., for the main d.c. power supplies and other purposes. Large numbers of Westinghouse rectifiers are wired into these computers that are supplied to customers in all parts of the world.

Westinghouse Brake and Signal Co. Ltd., 82 York Way, King's Cross, London, N.1. TERminus 6432

Ask your Wholesaler for

"ARMORDUCT" CABLES

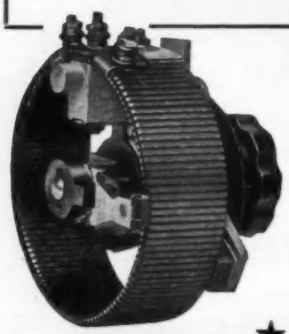
Always the Best

They comply in every respect with dimensions and tests laid down in the Amendments of the latest B.S.I. Specifications, and are manufactured throughout in our Factories at Long Eaton and Dorking

ARMORDUCT CABLE CO. LTD.
256 Westminster Bridge Road, LONDON, S.E.1. Factories: Long Eaton and Dorking
Telephone: Waterloo 6056 Telegrams: "Armorduct, Lamb, London" ABC Code (5th Edition)

a range of extremely robust

ROTARY RHEOSTATS



Open or enclosed types
100 watts
150 watts
200 watts
Larger sizes quoted on request

An extremely robust rheostat with a unique metal cored former (patent appd. for)

Full details from the manufacturers

The **CURTIS** *Manufacturing Company Limited*
26-28 PADDENSWICK ROAD
HAMMERSMITH, W.6
Telephone: RIV. 4456 and 4583

THE PERFECT FAULT FINDER
"NEO-MAINTEST"

POTENTIAL INDICATORS MADE TO MEET USERS' REQUIREMENTS

NEO ELECTRICAL INDUSTRIES LTD.
MANCHESTER 4

HOUSE SERVICE METERS

Credit Pattern
and Prepayment Type
200-240 v. A.C. S/Ph 50 c. (& D.C.)
AVAILABLE FROM STOCK
POLYPHASE 400-440 v. 3-Wire Type
Ex Stock

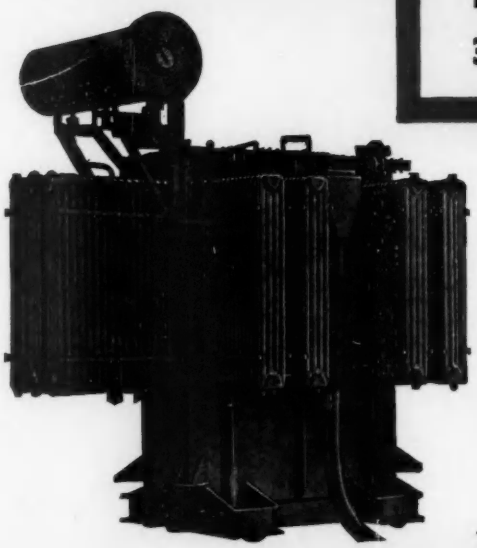
UNIVERSAL ELECTRICAL CO.
217-221 City Road, London, E.C.1

Published by ELECTRICAL REVIEW PUBLICATIONS LTD., at Dorset House, Stamford Street, London, S.E.1
and printed in Great Britain at THE CHAPEL RIVER PRESS, Andover, Hants.

POWER TRANSFORMERS

FOR GENERATION AND DISTRIBUTION

BUILT UP TO
30 MVA 132 kV



QUALITY
DELIVERY

THE ILLUSTRATION SHOWS A 4,000 kVA 3 PHASE 50 CYCLE 11,000/3,300 VOLTS TRANSFORMER, INSTALLED AT FRICKLEY COLLIERY N.E. DIVISION OF THE NATIONAL COAL BOARD.

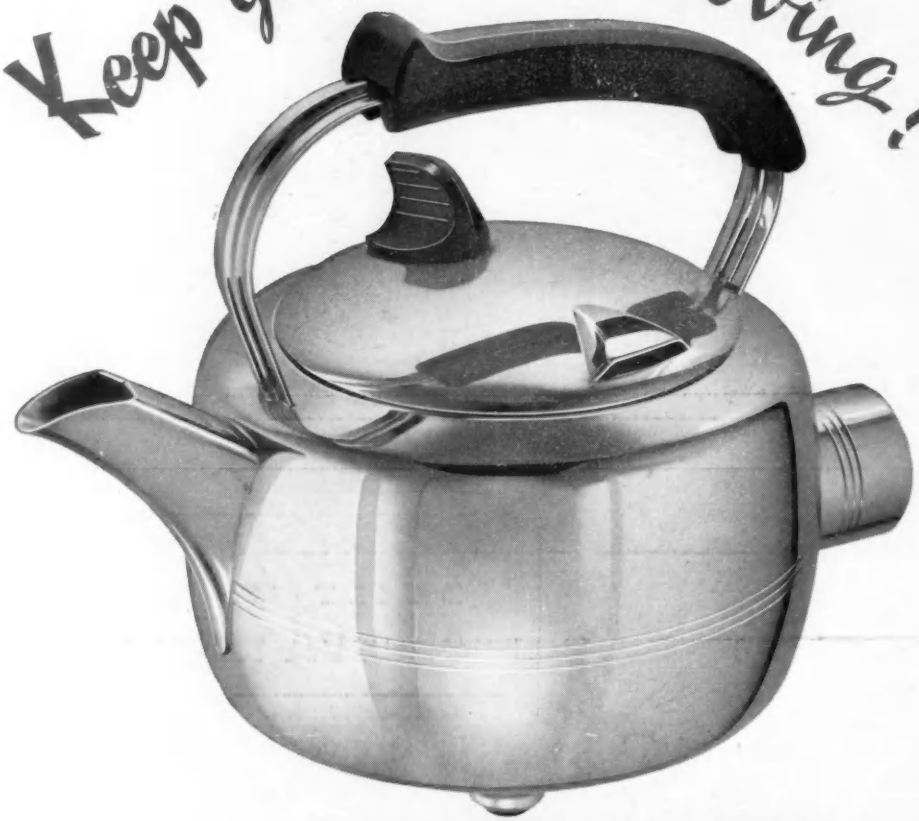
THE DENIS FERRANTI GROUP

DENIS FERRANTI CO. LTD.
ROYTON • OLDHAM • LANCASHIRE
Tel. MAIN (OLDHAM) 6651/2 Grams: DEFERRANTI, ROYTON

Sole Distributors for Canada: Eastern Electrical Supply Co., McGill Street, Montreal

CW 3541

Keep your Sales moving!



WITH SWAN BRAND

ELECTRICAL APPLIANCES & ALUMINIUM HOLLOWARE

Big Space **ADVERTISING** in national newspapers is creating increased sales for SWAN BRAND

COMMERCIAL T.V Coverage is your liveliest dealer aid— keep up your stocks to meet demand

Bulpitt & Sons Ltd., Birmingham 18

M-W.468